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Painted by CARL RUNGIUS.

THE AMERICAN MOOSE, IN NEW BRUNSWICK.

HORNADAY'S AMERICAN
NATURAL HISTORY

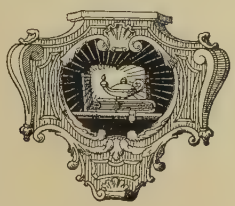
A Foundation of Useful Knowledge of the Higher Animals of North America

By

WILLIAM T. HORNADAY, Sc.D., A.M., Ph.M.

Formerly Director of the New York Zoological Park

Gold Medalist of the Royal Society for the Protection of Birds, The Government of the Republic of France The Royal Zoological Society of Antwerp, The New York Zoological Society, and The Camp-Fire Club of America; Silver Medalist of the French National Société d'Acclimatation; Holder of Cross of the Order of the Crown of Belgium



FOURTEENTH EDITION - *Revised*

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FOURTEENTH EDITION, REVISED

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PREFACE TO THE ELEVENTH EDITION

Since the first publication of this Natural History, in 1904, many and great changes have taken place among the wild vertebrates of the world. Most of them have been in the line of destruction and disappearance; some have been for preservation. It is unwise for people who think and reason to ignore these things. Some day posterity may awaken to the fact that a world destitute of the higher animals is only one remove from a desert.

The destruction and progressive extinction of the animal life of North America and its surrounding waters is to-day the most important and vital fact in the natural history of our continent. Beside it the world-wide search for "new species" is an academic pastime, which, even if successful, will not change the texture of a single hair, or produce one more mouthful of food. But on the subject of wild-life disappearance so much has been said, and so many warnings have been given, that editors and readers alike have grown tired of the subject, and have settled down into a state of dull apathy that certainly promises badly for the future.

During the past thirty years, as never before in the history of the world, the little Army of Wild-Life Defenders has fought with the well-armed millions of Destroyers many a fierce and prolonged campaign; and seldom have the former been beaten in a fight for a particular cause! We look back with satisfaction on the victories won for the game of Alaska, the water-fowl in 1911 and 1912, the new federal laws for all the migratory birds enacted between 1912 and 1918, the rescue of the fur seal in the bitter battle of 1911–1912, the victory for the millinery plumage birds of the world in 1913, and the saving of the last remnants of our big game from 1900 to 1926.

On the other hand, we look with sorrow and dismay upon the actual disappearance of the killable game birds of North America, and at the same time the disappearance of our song and insectivorous birds—a development that has gone on so silently and insidiously that now it is attracting no attention whatever, save from a silent and helpless few.

At this moment the students and exploiters of our birds and mammals simply will not study and expose the disappearance and the progressive extinction of those animal species. Of the six books fit for the library shelf that have been published in North America on this subject, five were written by the author of this volume. The author's practical interest in this subject and his efforts to perform his duty to posterity in the preservation of the wild life of North America, are attested by the list of measures which he initiated or assisted.

The most wide-spread disaster to the mammals of the world that has occurred since 1900 has been the awful slaughter of whales and sea-elephants. The steam whalers of Norway, England, Canada, and Japan, with their long-range cannon of great power, are now (1927) just completing the destruction of the whales of the world. The friends of wild life have been dimly aware of all this, but thus far no one has seemed able to mitigate the slaughter.

Since 1904 two things have been done which have helped to clarify public knowledge regarding wild-animal intelligence. Nature-fake stories have received permanent discouragement, and the publication in 1922 of the author's "Minds and Manners of Wild Animals" wrought in the United States a stabilizing effect on the public understanding of mammals, birds, and reptiles.

During the period from 1904 to 1927 the natural history museums of the United States have striven most diligently to collect specimens and mount large "habitat" groups of mammals, birds, and reptiles, before the animal materials therefor had entirely disappeared. This is a major effort for posterity, and the very artistic and valuable results of it are scattered from Brooklyn to Golden Gate Park. Two illuminating chapters upon this industry can be found in a book entitled "A Wild-Animal Round-Up."

It is cause for regret that during the past thirty years the old evolutionary grasshopper system of teaching zoology and "biology" in American colleges and universities seems to have undergone few changes for the better.

Among the writers of manuals of zoology, it is customary to begin with the lowest and least interesting forms of life and work upward toward the highest. That will answer for the advanced student, if he chooses to have it so, but for middle-grade students and all readers at home it is decidedly wrong. All lessons in practical natural history should begin with Nature's most important facts, and first bring forward her most interesting animals. To begin with the grasshopper and struggle through a hundred dreary pages of anatomy and low forms of life before reaching any creature of some personality and intelligence, is too much for the patience of any active student who wishes "to know about animals."

Anatomy is necessary to the advanced student; but in a book for schools and the general reader it is easily carried too far. As with human beings, the first thing to be learned about an animal is its place in nature, and after that its personality. It is only the scientific specialist who wishes to know first about its mandibular symphysis, the geography of its sutures, and the size of its auditory bullæ.

To college graduates who seek positions in the field of applied zoology, the shortcomings of modern teaching methods are painfully apparent. Show me the student who by his college education only is fitted to be an editor, or a curator, or a director of a museum or a zoo. To the average student an insistence that he shall spend three-fourths of his course in "biology" on the lowest and the least interesting forms of life, is often fatal to the student's honest desire to secure useful knowledge of wild animals.

Having said on this subject all that I can say, without making even a dent in the armor of the steel-clad evolutionary educators, I take leave of it forever, with all due sympathy for the innocent victims of an illogical system.

There is no royal road to a real acquaintance with living animals. Entertaining and truthful story-books about quadrupeds and birds are excellent in their way, but they do not, and cannot, go down to bedrock and lay foundations on which the pupil can build for aye. It has been decreed by Nature that he who will not work shall not know her works. There is no process by which the secrets of Nature can be placed automatically in a giddy mind.

The author maintains in this volume, and also out of it, that system is the only master key by which the doors of Animate Nature can be unlocked. Even with boys and girls fifteen years of age, the foundations of natural history classification must not be ignored! Let them but begin right, and the structure is bound to rise. *But beware of all chaotic jumbles of unrelated facts!*

As the reader will observe, I have striven to accomplish two ends: (1) To make clear each animal's place in the great system of nature, and (2) to introduce the animal in such a manner as to enable the reader to become personally acquainted with it. The subjects chosen for introduction are not confined to any one section of our country, but represent all North America, and even lands beyond. For the purpose of avoiding wide gaps, several important foreign animals have been included.

In the text of this work I have endeavored to give due credit for the noteworthy facts quoted from other authors. Practically the only instances wherein this has not been possible are those involving the geographic ranges of species, wherein combinations of authorities are the rule rather than the exception. To cover all possible omissions, I desire to mention here the names of the authors from whom I have derived many facts, but chiefly regarding distribution. I gratefully acknowledge indebtedness to Mr. D. G. Elliot's "Synopsis of the Mammals of North America and the Adjacent Seas"; to the many papers on our Mammalia by Dr. C. Hart Merriam, Dr. T. S. Palmer, and Mr. Vernon Bailey; to Mrs. Florence Merriam Bailey's "Birds of the Western United States." Mr. Frank M. Chapman's "Birds of Eastern North America," Dr. A. K. Fisher's "Hawks and Owls," and Mrs. Mabel Osgood Wright's "Birdcraft"; to Dr. Leonhard Stejneger's "Poisonous Snakes of North America"; Professor E. D. Cope's "Crocodilians, Lizards, and Snakes of North America," and Dr. H. Gadow's "Amphibia and Reptiles"; to Dr. David S. Jordan and Dr. Barton W. Evermann's "Fishes of North and Middle America," and "American Food and Game Fishes," and to Mr. Richard Lydekker's "Royal Natural History."

Naturally, I have drawn freely upon the zoological knowledge that has been accumulated in the Zoological Park.

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INTRODUCTION

THE GROUND-PLANS OF NATURE

Science is a collection of facts concerning natural objects or phenomena, arranged in good order, and made useful.

Natural Science is the study of Nature's works and forces, and embraces all things not made by man. Among its grand divisions may be mentioned natural history, chemistry, and physics.

Natural History is the study of Nature's common objects; but by most persons, this name is applied only to the study of animal life. Natural history treats of three great kingdoms—the animal, vegetable, and mineral.

The **Animal Kingdom** embraces not only all the living creatures which now inhabit the earth, but also those which have died, become extinct, and left only their buried remains, called fossils. Of the animal kingdom, three great groups of subjects may be recognized, as follows:

MAN, the study of whom is called ..... AN-THRO-POL'O-GY
THE LOWER ANIMALS, the study of which is called ..... ZO-OL'O-GY
EXTINCT, or FOSSIL ANIMALS, the study of which is called ..... PA-LE-ON-TOL'O-GY

In strict reality, Paleontology is only a branch of Zoology, for the two are inseparably dovetailed together. The living animals of to-day are the standards by which the paleontologist studies and determines those of the past.

This diagram illustrates the relations which the grand divisions of Natural History bear toward each other:

	Kingdoms.	Sciences.
NATURAL HISTORY (in a broad sense).	**Animal:**	An-thro-pol'o-gy Zo-ol'o-gy Pa-le-on-tol'o-gy
	Vegetable:	Botany Pa-le-o-bot'a-ny
	Mineral:	Ge-ol'o-gy Min-er-al'o-gy

In its broadest sense, Natural History includes Chemistry and Physics; but as that term is now commonly used, it is intended to refer only to the life histories of living creatures.

An Animal is a living creature belonging to the animal kingdom; but this word is commonly, though incorrectly, used to designate mammals alone.

The animals of the world are so vast in number, and so varied in form, that these lessons will treat only of the higher forms of life, known as *Ver'te-brates.*

A Vertebrate is an animal having (usually) a bony skeleton, and a spinal column, or backbone, composed of a series of bones called ver'te-brae. This division of life is called a *Branch.*

The Branch Ver-te-bra'ta is divided into seven grand divisions, called *Classes;* which are known as *Mam'mals, Birds, Reptiles, Am-phib'ians, Fishes, My'zonts,* and *Lance'lets.*[1]

[1] Two other Classes, Enteropneusts and Tunicates, are, by some modern zoologists, regarded as Vertebrates. These low forms, however, lack a complete backbone, or notochord, and are therefore omitted.

A Mam'mal is a warm-blooded creature, that brings forth its young alive, and nourishes it with milk from its own body. All land mammals, save a few species, are covered with hair; and all sustain life by breathing air with the aid of lungs. Except man, the mammals which live upon land are also called *quad'ru-peds*.

A Quad'ru-ped is a mammal which possesses four feet, or, having two hands and two feet, like the apes, yet walks upon all-fours.

Man is a bi'ped, or two-footed animal. Land mammals generally are quad'rupeds, or four-*footed*, and monkeys are *quad-ru'ma-nous*, or four-*handed*.

The term **quadrumana** is often applied to apes and monkeys because the long great-toe on the hind foot makes the foot quite hand-like in its grasping power.

A Bird is a warm-blooded animal, which comes from an egg that usually is laid and hatched by the parent. It breathes air, is covered with feathers, usually is provided with wings, and all save a few species can fly.

A Reptile is a cold-blooded, egg-laying animal, usually covered with scales or a bony shell. All have lungs and breathe air, but some are able to live in water so comfortably they are called *am-phib'i-ous*.

An Am-phib'i-an is a member of the Class of animals which forms a connecting link between reptiles and fishes. Some breathe air, and live alternately on land and in water, like frogs. Others have gills, and live in water all their lives. A few are capable of developing *either gills or lungs*, according to the presence or absence of water, like the wonderful Ax-o-lotl' of Mexico.

A Fish is a cold-blooded animal, possessing gills, fins, and (usually) scales. All save a very few species live permanently in water. The exceptions are certain fishes in the East Indies which for short intervals hop about on land, or even climb rocks or trees!

GRAND DIVISIONS OF THE ANIMAL WORLD

	Branches.	Classes.
THE ANIMAL WORLD.	**Ver'te-brates:**	Mammals, Birds, Reptiles, Amphibians, Fishes, Myzonts, Lancelets
	Insects:—Body in segments, reproduce by a complete change in form.	
	Crus-ta'ce-ans (Crabs, Lobsters, etc.):—Skeleton external; gill-breathing, chiefly aquatic.	
	Mol'lusks ("Shell-Fish"):—Soft-bodied, usually covered by a hard, limy shell.	
	Worms:—True worms, and other forms not fitting in elsewhere.	
	Star-Fishes:—Salt-water animals, with star-like structure.	
	Corals:—Minute, salt-water animals, which build up solid masses of their limy skeletons.	
	Jelly-Fishes:—Disk-shaped, jelly-like sea animals, with no hard parts.	
	Sponges:—Stationary aquatic animals, which look like plants; skeletons of tough, fibrous cells.	
	Pro-to-zo'ans:—Lowest forms of life, beginning with the single cell; mostly microscopic.	

HOW ANIMALS ARE CLASSIFIED

In order to know and appreciate even a small proportion of the world's animals, their correct arrangement into groups is as necessary as a systematic arrangement of the books in a vast library. By their forms and characters, animals are divided into natural groups and subdivisions, and in

order that we may understand their proper relationships, and their places in Nature, we must learn and remember the general principles of animal **classification.** Without this foundation knowledge, a clear view of the splendid domain of animal life is impossible, and the life histories of our living creatures will be but a jumble of disconnected facts, of very slight practical use.

When properly simplified, the classification of the principal groups of our vertebrate animals is as easily learned and remembered as the leading facts of geography. Once learned, each animal observed thereafter can be located in the group to which it belongs, and its place in Nature understood. This helps toward exact knowledge of its anatomy and habits.

No-men'cla-ture is the naming of animals, and the groups to which they belong. The object of popular nomenclature, or naming, is to make the place and character of an animal clearly and correctly understood by the greatest possible number of people.

Scientific nomenclature relates to the use of technical names, in Latin or Greek, in which the general student is not often interested. Whenever through frequent or frivolous changes of scientific names, or by the giving of too great a number of them, our knowledge of animals becomes confused and uncertain, scientific classification defeats its own object, and becomes worse than useless. The observance by technical writers of the fatal rule of priority, by which the most obscure names often are exalted at the expense of more appropriate names in universal use, is rapidly debasing the legitimate value of Latin names generally, and creating wide-spread uncertainty and confusion.

Latin words are used for most scientific names, because Latin is the universal language of scientific men, the world over; and Latin names are used by all educated nations without change in form.

In the development of animal classification, the various classes of animals are subdivided into groups which gradually grow smaller, until at last each species is named and placed, thus:

Classes are divided into Orders:
Orders " " " Families:
Families " " " Genera (singular = genus):
Genera " " " Species (singular = species):
Species " " " Individuals.

As an example, take the Puma, or Mountain " Lion."

Its Order is FE'RAE, the wild beasts.
" Family is *Fe'li-dae,* the Cats.
" Genus is *Fe'lis,* the true Cats.
" Species is *concolor,* gray.
" Scientific name, therefore, is *Felis concolor.*

All these groups are divided into subdivisions, such as suborders, subfamilies, subgenera, and even subspecies; but in the writer's opinion there is very little excuse for their creation, or for their continued existence, and the student will do well to let them alone—until he feels the need for them.

A *tau'to-nym* is a scientific name in which the name of the genus is repeated as the name of the species. Thus, some authors write the Latin name of the American Bison as *Bison bison;* and the Anhinga is *Anhinga anhinga.* In America, the tautonym habit is merely another step toward the complete demoralization of zoological nomenclature.

A tri-no'mial is a name in three sections, applied to a subspecies; such as *Felis concolor oregonensis.*

By scientific authors, *species* are frequently divided into *subspecies,* or *races,* because in widely separated localities, animals of the same parent stock sometimes are so influenced by differences in climate, food, and surroundings that they assume different colors, or grow larger or smaller than the type. But, no matter how much individuals may differ in size and color, if it is possible to bring together a collection of specimens which will show *all stages of variation from the type to*

the extremes, then the specimens all belong to the same species. Thus, in passing from New York to Ohio, specimens of the Gray Squirrel show all shades of variation, from the typical gray to black; but all belong to the same species, called in Latin, *Sci-u'rus car-o-li-nen'sis.*

A Species is an assemblage of individual animals which in at least one respect are distinctly different from all others, and whose peculiarities are so well marked and so constant that they can be distinguished from all others without the aid of locality labels.

When a new kind of animal is found, adult specimens of which are distinctly different from those of all known species, an average specimen is taken as a *type*, and it is *described*, and christened by its describer. Every species should be distinguishable by external characters; and any animal which requires to be killed and dissected before it can be named, is of no practical value as an independent form.

To secure **recognition** among zoologists, it is important that the first description of a new species should appear in a regular publication of some scientific society, or in a scientific journal. In case the creature has not already been described, and the proposed species has just claims to stand alone, this name is entitled to stand, by right of **priority,** or first christening.

Many times it happens that through ignorance of what has been done by others, or by errors in judgment, a new name is bestowed upon an animal or plant that has already been named. Sometimes, also, it is found that the name bestowed has already been used for some other animal. A name applied to an animal or plant already named is called a *syn'o-nym.* In scientific books, synonyms sometimes are printed in a list under the correct name, followed by the names of their respective authors. A zoological synonym always stands for a published error, and scientific authors should be chary of describing as "new" any species which are likely to prove mere synonyms.

The type of any species is a carefully selected specimen which in size and color may fairly be considered the standard, or average, for that species. Among zoologists, this term is applied to the identical skin, or other specimen, described by its discoverer. Because of the many scientific names that are erroneously bestowed upon animals, the name of the author who is responsible for a name is usually printed, in abbreviated form, immediately after the name itself, thus:

Popular name.	*Scientific name.*	*Authority.*
Coyote.	*Canis latrans.*	Say.

A parenthesis enclosing a Latin name and the name of its author is a sign that the name has been changed somewhat from the form originally chosen and put forth by the author of the species.

Taken as a whole, this name means (1) that the "popular" name of the animal is Coy'ote; (2) that its scientific name (Latin) is *Canis* (=dog) *la'trans* (=barking); and (3) that it was first correctly described and named in print by a man named Say. If we consult our books, we will find that Thomas Say was a Philadelphia naturalist, and his description of this animal appeared in "Long's Expedition to the Rocky Mountains," published in 1823, Vol. I, page 168.

Whenever the name of an animal has been so long in use that it has become familiar to millions of people, any attempt to change it tends to create confusion. A slightly incorrect name in universal use is often better than the confusion and doubt inseparable from attempting a change. Thus, the American buffalo, considered in connection with the world's bovine animals generally, is really a bison; and the prairie-"dog" is really a prairie marmot; but since nearly all the inhabitants of America know these animals by their incorrect names, and any effort to force a universal change would be quite fruitless, it would be unwise to attempt it.

It is very important to the student that the names of the various Orders of vertebrate animals should be learned and remembered; for they are the keys with which to unlock and reveal all systematic knowledge of mammals, birds, reptiles, amphibians, and fishes.

THE INTELLIGENCE OF WILD ANIMALS.

From 1900 to 1904 there developed in the United States a wave of nature-faking story-writing that swept over our entire country like an epidemic. It was manifested in the publication of wild-

animal imaginings under the stamp of truth. The newspapers of that day were abundantly stocked with them, and there were books of them not a few.

Finally this outbreak of mishandling of the intelligence of wild animals evoked an outbreak of protest, which fortunately had an immediate and pronounced effect. The public became wise, and the flood stopped.

In the original edition of this Natural History, the writer of it took definite ground against nature-faking and exaggeration in the writing of wild-animal lore; but he also published (for the first time) a basic pronouncement of the right of real wild-animal fiction, openly displayed, to a recognized place in the sun. He registered cordial approval of the wild-animal-hero tale of imagination that is true to life so far as the personality and daily life habits of the hero are concerned. This bit of doctrine received the cordial approval of President Theodore Roosevelt, and it is our belief that the open-hearth fiction story of wild animals now is fully recognized and approved by the American public. Furthermore, there is no better hall-mark for such a story than the introduction of an animal that assumes to risk a close-up talk with savage man.

If every man devoted to his affairs, and to the affairs of his city and state, the same measure of intelligence and honest industry that every warm-blooded wild animal devotes to its affairs, the people of this world would abound in good health, prosperity, peace, and happiness.

To assume that every wild beast and bird is a sacred creature, peacefully dwelling in an earthly paradise, is a mistake. They have their wisdom and their folly, their joys and their sorrows, their trials and tribulations.

As the alleged lord of creation, it is man's duty to know the wild animals truly as they are in order to enjoy them to the utmost, to utilize them sensibly and fairly, and to give them a square deal.

To the inquirer who enters the field of animal thought with an open mind, and free from the trammels of egotism and fear regarding "man's place in nature," this study will prove an endless succession of surprises and delights. In behalf of the utmost tale of results, the inquirer should summon to his aid his rules of evidence, his common sense, his love of fair play, and the inexorable logic of the youthful geometry.

In studying the wild-animal mind the boundary line between Reality and Dreamland is mighty easy to cross. He who easily yields to seductive reasoning, and the call of the wild imagination, soon will become a dreamer of dreams and a seer of visions of things that never occurred. The temptation to place upon the simple acts of animals the most complex and far-fetched interpretations is a trap ever ready for the feet of the unwary. It is better to see nothing than to see a lot of things that are not true.

In the study of animals we have long insisted that to the open eye and the thinking brain, truth is stranger than fiction. But Truth does not always wear her heart upon her sleeve for zanies to peck at. Unfortunately there are millions of men who go through the world looking at animals, but not seeing them.

Beware of setting up for wild animals impossible mental and moral standards. The student must not deceive himself by overestimating mental values. If an estimate must be made, make it under the mark of truth rather than above it. While avoiding the folly of idealism, we also must shun the ways of the narrow mind and the eyes that refuse to see the truth. Wild animals are not superhuman demigods of wisdom, but neither are they idiots, unable to reason from cause to effect along the simple lines that vitally affect their existence.

Brain-owning wild animals are not mere machines of flesh and blood, set a-going by the accident of birth and running for life on the narrow-gauge railway of Heredity. They are not "Machines in Fur and Feathers," as one naturalist once tried to make the world believe them to be. Some animals have more intelligence than some men; and some have far better morals.

Many a mind misinterprets the thing seen, sometimes innocently, and again wantonly. The nature-fakir is always on the alert to see wonderful phenomena in wild life, about which to write; and by preference he places the most strained and marvelous interpretation upon the animal act. Beware of the man who always sees marvelous things in animals. for he is a dangerous guide. There

is one man who claims to have seen in his few days in the woods more wonders than all the older American naturalists and sportsmen have seen added together. Now, Nature does not assemble all her wonderful phenomena and hold them in leash to be turned loose precisely when the great Observer of Wonders spends his day in the woods. Wise men always suspect the man who sees too many marvelous things.

The proper place in which to study the minds, manners, and morals of wild animals is in the most thickly populated haunts of the most intelligent species. The free and untrammeled animal, busily working out its own destiny unhindered by man, is the beau-ideal animal to observe and to study. Go to the plain, the wilderness, the desert, and the mountain, not merely to shoot everything on foot, but to SEE animals at home, and there use your eyes and your field-glass. See what normal wild animals do as "behavior," and then try to find out why they do it.

The wild animal must think, or die.

The next best place for study purposes is a spacious, sanitary, and well-stocked zoological park, wherein are assembled great collections of the most interesting land vertebrates that can be procured from all over the earth. There the student can observe many new traits of wild-animal character as they are brought to the surface by captivity. There will some individuals reveal the worst traits of their species. Others will reveal marvels in mentality, and teach lessons such as no man can learn from them in the open. To study temperament there is no place like a zoo.

RULES FOR MEASURING MAMMALS

The increasing amount of attention that is being paid to the measurements and weights of animals renders necessary the adoption of a uniform system, in order that species and individuals may be compared on a fair basis. To promote this end the following rules were formulated and published in 1904:

Small Mammals Generally

1. Record all measurements in feet and inches, and leave the metric scale for those who prefer a foreign system.

2. Measurements of skins are of very slight value; therefore, always measure a specimen before skinning it.

3. Lay every mammal on its side, pull the head straight forward, and measure from the tip of the nose to the point where the tail joins the body. This is the "*Length of head and body.*"

4. From the last-mentioned point, measure to the *end of the tail vertebrae, not* the hair, for "*Length of tail.*" If the tail-tuft is important, measure it separately.

5. Weigh large examples of species that are larger than rats and mice; and in each case, *weigh the whole of the specimen.*

Large Mammals

1. The "*Height at the shoulder*" is the most important measurement. To obtain this, hold the uppermost foreleg *as nearly as possible in the position it occupied when supporting the animal.* Do *not* measure from the "point of the hoof"; for that means nothing. Hold the hoof with its bottom parallel with the body, as when the animal stood upon it; erect there a stick to mark the bottom line, and another to mark the top of shoulders, at the skin. The distance between the two perpendiculars, in a straight line, will be the true height of the animal. Do not follow any curves.

2. The "*Length of head and body*" must be obtained in a *straight line* between root of tail and end of nose, *with the head drawn straight forward,* and not following any curves. The "*Length of tail*" is from its base to the end of the vertebrae.

3. The "*Girth*" is the tight circumference of the animal immediately behind the forelegs.

4. The "*Depth of the body*" is the distance in a straight line from the top of the shoulders to the brisket, or lower line of the breast, immediately behind the foreleg. To artists, sculptors, and taxidermists, this is a very important measurement.

5. The "*Circumference of the neck*" is taken half way between the ears and shoulders, close to the skin.

6. The "*Length from head of femur to head of humerus*" is also a highly valuable figure for artists, and it is easily taken by feeling through the skin for the high points of those joints.

7. Weigh an animal before it is "dressed"; but if the dressed weight of a deer is known, a close approximation to its live weight can be obtained by the aid of the rule given on page 124.

BOOK I

MAMMALS

CHAPTER I

THE ORDERS OF MAMMALS

The living mammals of the world, as distinguished from those which are extinct, or fossil, may be divided into thirteen grand divisions, called **Orders.** The order is the foundation of mammalian arrangement. Without adequate knowledge of these divisions, a clear understanding of the relationships of mammals is quite impossible.

It is customary with technical writers to begin with the lowest forms of life, and toil upward toward the highest; but it is very discouraging to the young student to find the most interesting forms the farthest away. Frequently the most interesting animals are never reached! For many reasons, it is best that the general student should study first the forms that are most important, and also most interesting, and thus make sure of them. We therefore begin our studies of the animal kingdom with the highest forms, and adopt the latest names that have come into use amongst zoologists.

While the great majority of the examples cited will be North American, a few from other continents will be introduced to complete the chain of important facts.

THE ORDERS OF LIVING MAMMALS.

ORDER.	PRONUNCIATION.	MEANING.	EXAMPLES.
PRIMATES	*Pri'matz*	First order	Man ; apes and monkeys.
FERAE, or Carnivora	*Fe're*	Flesh-eating Wild Beasts	Cats, dogs, bears, weasels.
PINNIPEDIA	*Pin-ni-pe'dia*	Fin-footed	Sea-lions, seals, walrus.
INSECTIVORA	*In-sec-tiv'o-rah*	Insect-eaters	Moles and shrews.
CHIROPTERA	*Ki-rop'ter-ah*	Wing-handed	Bats and flying-"foxes."
GLIRES, or Rodentia	*Gli'rez*	Gnawers	Hares, gophers, rats, squirrels.
UNGULATA	*Un-gu-la'tah*	Hoofed	Cattle, deer, sheep, swine, tapirs.
CETE	*Se'te*	Whales	Whales, porpoises, dolphins.
SIRENIA	*Si-re'ne-a*	Sea-cows	Manatee and dugong.
EDENTATA	*E-den-ta'ta*	Toothless	Armadillos, sloths and ant-eaters.
EFFODIENTIA	*Ef-fo-de-en'shia*	Diggers	Pangolin and aardvark.
MARSUPIALIA	*Mar-su-pi-a'li-a*	Pouched	Opossum, kangaroo.
MONOTREMATA	*Mon-o-trem'a-ta*	Single duct	Platypus and echidna.

EXPLANATION OF THE CHART OF THE ORDERS OF MAMMALS.

To the beginner in Natural History studies, the Order is the master-key to classification.

This Chart is based on the well-known fact that in the pursuit of a difficult study, any scheme which properly and truthfully appeals to the eye is an aid both to the understanding and the memory. It shows the relative importance of the various Orders of Mammals, but *not* their relative sizes, based on the number of species in each, as has been done later on with the birds. If number of species were given precedence over economic importance, the Order Glires would dominate, and the Order Ungulata would appear small and insignificant.

It is impossible to construct a diagram which will show correctly the relations which the various Orders bear toward each other, anatomically. This is because some Orders are characterized by their teeth, some by their feet, or hands; others by their wings, and two by their mode of producing their young.

It will be noted that:

The Primates, of the tree-tops, have the highest position.

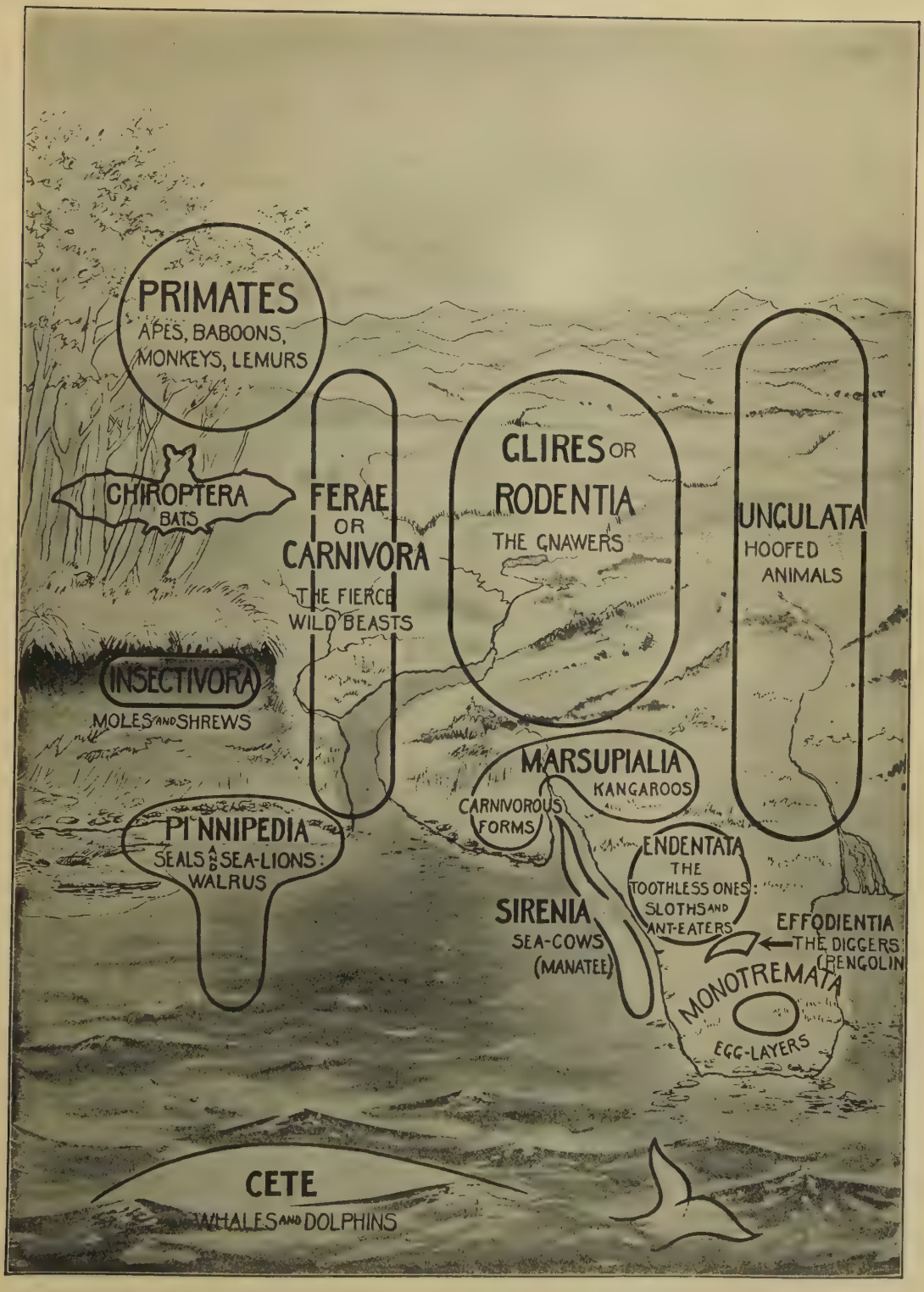
The Cete, which in some respects are the lowest of the Mammalia, occupy the lowest position.

The Bats are shown in mid-air, and the Insectivores appear under ground, where they live out their lives.

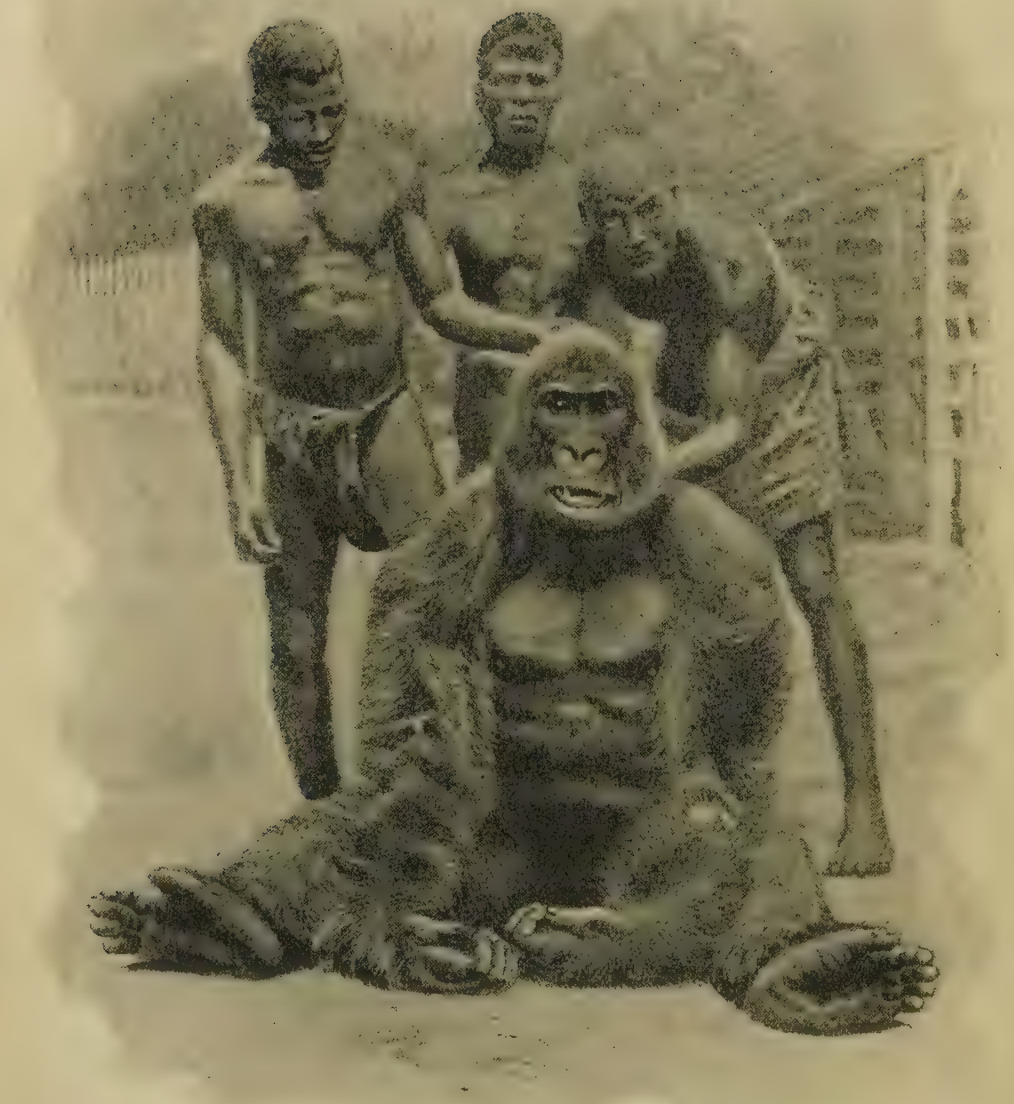
The Seals and Sea-Lions appear both on the shore and in the sea, and the Sirenians are located in an estuary.

The Ferae, Glires and Ungulata spread throughout the whole visible earth, covering forest and plain, sea, pond and stream, from the sea to the most distant mountains.

The Monotremates, or egg-laying mammals, are quite apart from all other land mammals, and appear low down, near the home of the ducks, as shown on the bird chart. The space allotted to this strange Order has been made egg-shaped, to suggest the leading characteristic of its members.



LANDSCAPE CHART OF THE ORDERS OF LIVING MAMMALS.



GORILLA.

Shot and photographed at Tsonu Town, West Africa, by H. PASCHEN.

CHAPTER II

THE ORDER OF APES AND MONKEYS

PRIMATES

This Order includes all creatures with hands, and hand-like feet. With the exception of the Japanese red-faced monkey, the tscheli monkey of China, and two or three other Chinese species, all its members inhabit the tropics, far below the frost line. It is on or near the Equator that the lower Primates reach their highest development, and the great apes approach nearest to man. Let it not be supposed, however, that the chain of evolution from the aye-aye to the gorilla is complete; for the gap between the gibbons and the monkeys is much greater than that between the gorilla and man.

All men, even savages, are specially interested in apes and monkeys, because they are the highest of the lower animals, and stand nearest to man. There is no human being of sound mind to whom their human-likeness does not appeal. For this reason, we will introduce here several species which are not found in the New World, for the reason that without them our Foundation for the Mammalia would be incomplete.

Although tropical America contains a very respectable number of species of monkeys, they are, as a whole, both structurally and mentally, far lower than the monkeys and baboons of the Old World. Structurally they are weak, in spirit they are timid and cowardly, and intellectually they are dull to the point of stupidity. With the exception of the sapajous, they are in general so ill fitted to survive that if they are on exhibition it is a difficult matter to keep any of them alive in captivity much longer than one year. If not exhibited, they survive longer.

On the other hand, very many of the monkeys and baboons of the Old World have developed first-class fighting powers, and pugnacious tempers. They have dangerous canine teeth, wide-spreading jaws, strong muscles, and keen wits for either attack or defence. The Lemuroids, however, the lowest of the Primates, are as mild-mannered and harmless as rabbits.

With Ethnology, the study of the races of Mankind, we have here nothing to do. That subject is so interesting, and so vast in its extent, that nothing less than an entire volume can adequately set it forth. The grand divisions of the Primates in general are as shown below.

		FAMILIES.		EXAMPLES.	
ORDER PRIMATES.	SUB-ORDER ANTHROPOIDEA:	MAN,	*HOM-IN'I-DAE.*		
		ANTHROPOID APES,	*SIM-I'I-DAE.*	**Gorilla,**	*Gorilla gorilla.*
				Chimpanzee,	*Pan troglodytes.*
				Orang-Utan,	*Simia satyrus.*
				Gibbon,	*Hylobates leuciscus.*
		OLD-WORLD MONKEYS AND BABOONS,	*CER-CO-PI-THE'CI-DAE.*	**Japanese Red-Faced Monkey,**	*Macacus speciosus.*
				Diana Monkey,	*Cercopithecus diana.*
				Gelada Baboon,	*Theropithecus gelada.*
		NEW-WORLD MONKEYS,	*CEB'I-DAE.*	**White-Throated Sapajou,**	*Cebus hypoleucus.*
				Black Spider-Monkey,	*Ateles ater.*
				Howlers,	*Alouatta.*
		MARMOSETS,	*CAL-LI-THRI'CI-DAE.*	**Common Marmoset,**	*Callithrix jacchus.*
	SUB-ORDER LEMUROIDEA:	LEMURS,	*LE-MUR'I-DAE.*	**Ruffed Lemur,**	*Lemur varius.*
		TARSIER,	*TAR-SI'I-DAE.*	**Tarsier,**	*Tarsius tarsius.*
		AYE-AYE,	*DAU-BEN-TON-I'-I-DAE.*	**Aye-Aye,**	*Daubentonia.*

The Apes.—The three great man-like (or an'thro-poid) apes — gorilla, chimpanzee and orang-utan—are so much like human beings that, to most persons, they are the most wonderful of all living creatures below man. Their points of resemblance to man are so many and so striking that they are a source of wonder even to savages.

By permission of J. F. G. Umlauff.

SKELETONS OF MAN AND GORILLA.

1, cervical vertebrae,
2, collar bone,
3, humerus,
4, sternum,
5, ribs,
6, rib cartilages,
7, dorsal vertebrae,
8, lumbar vertebrae,
9, pelvis,
10, radius,
11, ulna,
12, carpals,
13, metacarpals,
14, phalanges,
15, cavity of pelvis,
16, sacrum,
17, femur,
18, patella,
19, fibula,
20, tibia,
21, tarsals,
22, metatarsals,
23, phalanges.

As will be observed from a comparison of the skeletons of man and gorilla, below the skull their parallelism is remarkably close. Both in kind and in number the bones are the same, and they differ only in their proportions. The hands and feet of the gorilla are designed for a life that is half terrestrial and half arboreal, while those of man are for life on the ground. The long thumb and great toe of the gorilla are far superior to those members in the chimpanzee and orang-utan.

The widest differences between man and the gorilla are in their skulls. In the gorilla, the high forehead and intellectual faculties so characteristic in man are totally wanting, indicating a very low order of intelligence. The long and powerful canine teeth are alone sufficient to proclaim the savage wild beast.

To many persons it seems strange that notwithstanding the seemingly wide differences between the various races of men, all mankind be referable to a single species. In spite of the vast differences in intellect between the native Australian—not yet out of the stone age—and a Caucasian philosopher, both belong to *Homo sapiens*, and between them there is not even a subspecific difference.

Even if the great apes could talk as well as the Veddahs of Ceylon, whose vocabulary consists of about two hundred words, their anatomical differences from the genus *Homo* would separate them quite as widely as they now are. To segregate a species requires a *structural difference that is constant.*

The Gorilla[1] is the largest, the ugliest, the most fierce in temper, and by reason of its shorter arms and longer legs, it is really the nearest to man. It is the only ape that walks erect without being taught, and that spends a considerable portion of its life upon the ground. In bulk it is larger than an average man, and its

[1] *Go-ril'la gorilla.*

arms and chest are of enormous proportions.[1] The countenance of the Gorilla is very ugly and repulsive, and the shape of its skull is much farther from that of man than are those of the chimpanzee and orang-utan. Its skin is black, and the hair of full-grown specimens is grizzly gray.

During the past twenty years it has been discovered that the Gorillas of Africa (two species or more) are not limited to a small equatorial area on the west coast, as for a century had been believed. An eastern colony of about one hundred and fifty very large Gorillas of a new species was discovered inhabiting a group of high, jungle-covered peaks, with Mt. Mikeno as the leader, about fifty miles northeast of Lake Kivu, opposite the southern end of Lake Victoria. Another colony is known to exist one hundred miles westward, but it would be unsafe to assume that the Gorillas are found two-thirds of the way across Africa.

Mr. T. Alexander Barns says: "Like the Gaboon gorilla, the eastern gorilla is not a tree-dweller. It lives its life upon the ground, on all fours," . . . and they are "not so aggressive nor so savage that they wantonly attack men." The very large male specimen killed by Carl E. Akeley weighed 360 pounds. (See "Tales from Nature's Wonderlands," pp. 201–212.)

In London, in 1919–1920, it was discovered by Major Rupert Penny and Miss Alice Cunningham that the Gaboon gorilla is not an animal of dull and stupid mind, nor of morose temperament. Under their friendly care and companionship their "John Daniel" specimen revealed a wonderfully alert mind, of excellent reasoning power, and marked originality of thought. Most surprising of all, "John" displayed a bright and cheerful disposition and strong individuality. (See "Minds and Manners of Wild Animals," pp. 93–100.)

The Chimpanzee[2] is about one-third smaller than the gorilla. Its brain, face, ears and hands are more man-like than those of any other ape, and its large brain and keen mind render it in thought and habit much more man-like than the gorilla. It is an animal of bright and cheerful disposition, though subject to sudden fits of bad temper, and having a good memory, it is easily taught. Young Chimpanzees are affectionate and child-like, but when large and strong, the males are usually dangerous, and not to be trusted. Some individuals have displayed remarkable intelligence. "Sally," of the London Zoological Gardens, could count correctly up to five, whenever bidden, and hand out the correct number of straws.

After several years of observation of living Chimpanzees and orang-utans, in daily comparison, I am convinced that the only substantial psychological differences between the two species are (1) that the temperament of the Chimpanzee

N. Y. Zoological Park.

YOUNG FEMALE CHIMPANZEE.

is of the nervous type, and its mind is more alert and prompt in action than that of the orang, while on the other hand (2) the temperament of the orang is sanguine, its disposition is more serene, and while its mind may be somewhat less showy on exhibition, its capacity is quite equal to that of the Chimpanzee. The greater quickness of the Chimpanzee, both in thought and action, renders it on the whole the best show animal in public performances.

Many persons consider the Chimpanzee superior in intelligence to the orang-utan, but thus far the only real difference appears to be that the

[1] The average man of the Anglo-Saxon race is 5 feet 6 inches in height and weighs 160 pounds.

[2] *Pan troglodytes.* Described in most books under the untenable and more unwieldy name of *Anthropopithecus troglodytes.* This animal has been described under nine different generic names, but *Pan* is the oldest one available and the best.

By permission of Edwards Bros.

A DRESSED-UP CHIMPANZEE.

mind of the former is more alert, and acts more quickly than that of the orang.

In walking, the Chimpanzee does not place the palms of its hands flat upon the ground, but bends its fingers at the middle joint, and walks upon its knuckles.

It does not, as so often asserted on hearsay evidence, build a hut or a roof of branches under which to sleep. Its home is the heavy forest region of equatorial Africa, from the Atlantic ocean to Lake Tanganyika. Like the gorilla, its skin is black, and when young its hair also, but when fully grown its hair is dark iron-gray. This animal can at one glance be distinguished from the orang-utan by the greater size of its ears, and its black color.

The Orang-Utan (from two pure Malay words, "orang" = man, and "utan" = jungle) is also about two-thirds the size of the gorilla, and is easily recognized by its brick-red hair, brown skin and small ears. The largest specimen on record stood 4 feet 6 inches in height from heel to head, measured 42 inches around the chest, and between finger tips stretched 8 feet. The old males develop a strange, flat expansion of the cheek, called "cheek callosities," 13 inches across; but in young animals this is seldom developed. The hand is $11\frac{1}{2}$ inches long, the foot $13\frac{1}{2}$ inches, but the width of each across the palm is only $3\frac{3}{4}$ inches. The weight of a large, full-grown male Orang is about 250 pounds.

The black gorilla and chimpanzee both inhabit the land of black men; the brown Orang-Utan lives only in Borneo and Sumatra, the land of the brown-skinned Malay. The latter prefers the belt of level, swampy forest near the coast, lives wholly in the tree-tops, and rarely descends to the earth except for water. Orangs travel by swinging underneath the large branches with their long, muscular arms. Because of their great weight, they cannot leap from tree to tree, as monkeys do, but they swing with wonderful rapidity and precision. They eat all kinds of wild fruit, fleshy leaves, and the shoots of the screw pine.

In proper hands, young Orang-Utans are very susceptible to training. In 1901 the New York

Drawn by C. B. Hudson.

A FIGHT IN THE TREE-TOPS.

Old male Orang-Utans, with cheek callosities.

FEMALE ORANG-UTAN AND YOUNG.

Drawn from specimens living in the New York Zoological Park, by A. G. DORING.

Zoological Park contained four Orangs, all of which were easily taught to wear clothes, sit in chairs at table, eat with fork and spoon, drink from cups and bottles, and perform many other human-like actions without nervousness, in the presence of two thousand visitors. Each of the Orangs learned its part in about two weeks' training, and at the dinner-table acted with gravity and decorum. "Rajah," the senior member of the quartette, never once suffered from stage fright, or lost his nerve during a public performance.

In captivity, young Orang-Utans are as affectionate as human children, and very fond of their human friends. In the jungles of Borneo the full-grown males often fight savagely by biting each other's faces, and by biting off fingers and toes. At night the Orang makes a nest to sleep upon, by breaking off leafy branches, and laying them cross-wise in the forked top of a sapling. On this huge nest-like bed it lies flat upon its back, grasps a branch firmly in each hand and foot, and is rocked to sleep by the cradle-like swaying of the tree-top.

Unless attacked at close quarters, in their forest homes, none of the great apes is dangerous to man. All of them flee quickly from the dreaded presence of Man, the Destroyer. They never fight with clubs, but when attacked at close quarters they bite, just as do human roughs. When enraged, the gorilla *does* beat its breast with its fists, just as Du Chaillu said; and it does this even in captivity.

"The Missing Link."—For thirty years at least, Science has been seeking in the earth for fossil remains of some creature literally standing between man and the great apes, but at present unknown. In 1879, Mr. A. H. Everett made for the Zoological Society of London a thorough examination of the deposits on the floors of some of the caverns of Borneo. To-day, some naturalists are straying toward the lemurs in search of the parent stem of man's ancestral tree. Vain quest! The gap between Man and Lemur is too great to be bridged in this world. A coincidence between skull bones is a long way from manlikeness.

Place upon the shoulders of a gorilla the head of a chimpanzee, and we would have—what? The Missing Link, no less,—a hairy, speechless man! The man-apes we have. Let those who seek the undiscovered ape-man search the Tertiary deposits of the fertile uplands that lie between the gloomy equatorial forests of the black apes and the Bushmen of South Africa; for there, if anywhere, will the Missing Link be found.

The Gibbons.—From the three huge, coarsely-formed and unwieldy man-like apes described above, the line of descent drops abruptly and far. Their nearest relatives are the Gibbons—creatures of small size, marked delicacy of form, no weight or strength to speak of, but of marvellous agility in the tree-tops. Their heads are small and round, their teeth are weak, and their faces are like those of very tiny old men.

Their arms and hands are of great length in proportion to their body size, yet so very slender are their muscles that a live Gibbon seems like a hairy skin drawn over a skeleton. The largest specimen I measured in Borneo had the following remarkable dimensions: head and body, 19 inches; extent of outstretched arms and hands, 5 feet 1 inch; entire reach of arms and legs, 5 feet 1 inch; hand, 6½ inches long by 1 inch wide; weight, 10¼ pounds.

Of Gibbons there are about six species, and they inhabit Borneo, Sumatra, the Malay Peninsula, Burmah and Siam. With the **Gray Gibbon,**[1] of Borneo, I am well acquainted; and after the three great man-like apes, it is to me the most wonderful of anthropoids. They are very timid, the shyest of all Primates that I ever hunted, and wonderfully successful in eluding the hunter.

In a way that is most strange for an ape, a Gibbon on the ground promptly rises on its feet, and easily walks quite erect. Each arm is held out at half length, with the forearm bent upward, as an aid in balancing the body. The Gibbon foot takes the ground the best of any ape foot unaided by shoes.

The most wonderful habit of the Gibbon is its flight down hill when pursued. Of course it never dreams of descending to the earth, but in the half-open hill forests of Borneo I have seen these creatures go downward through the tree-tops, in a straight course, leaping incredible distances, catching with their hands, swinging under, catching with their feet, turning again, and so on by a series of revolutions, almost as fast as the flight of a bird.

[1] *Hy-lo-ba'tes leu-cis'cus.*

The Siamang,[1] of Sumatra, is the largest and rarest of the Gibbons. It is jet black, all over, face as well as fur, and it has a throat pouch which is distended to astounding proportions when it utters its peculiar, piercing cry. This species is as rare in captivity as the gorilla, and the only specimen seen alive in the New World up to 1903 was exhibited at the New York Zoological Park in that year.

OLD-WORLD MONKEYS AND BABOONS.

Cercopithecidae.

Typical Old-World Monkeys.—Asia, Africa and the islands of the Malay Archipelago contain a great number of species of monkeys. The most northern is the sturdy **Japanese Red-Faced Monkey,** with no tail to speak of. It is

SANBORN, Photo., N. Y. Zoological Park.

JAPANESE RED-FACED MONKEY.

Note the narrow space between the nostrils.

clothed with long, shaggy hair, and those in the New York Zoological Park live outdoors all winter, and gallop about in the snow without catching cold. Their tempers are quite as warm as their blood.

From Japan, monkey-land extends southward through China, and southern Asia generally, the

DIANA MONKEY.

Malay islands almost to Australia, and throughout the whole of Africa except its great deserts, to the extreme south.

Of all these Old-World species, *none have prehensile* (grasping) *tails*, like many American species. Many of them are beautifully colored, however, and the markings of some are quite fantastic. The **Diana Monkey,** of West Africa, is elaborately marked with black, white, gray and brown, and it is one of the most beautiful of all monkeys. An old-world monkey can nearly always be recognized by the very narrow space between the nostrils.

Short-Tailed Monkeys.—It must not be supposed that because the tail of a monkey is so short as to be scarcely visible, the wearer is therefore a true ape. There are several baboon-like animals with tails exceedingly short and insignificant, but which are far removed from the true apes. Some of these are *called* apes, but they are all much lower in the scale. Of these, the most important are:

The Black "Ape" of Celebes;

The Barbary "Ape" of Gibraltar and North Africa;

The Pig-Tailed Ma-caque′ (pronounced Ma-cak′) of the East Indies, east of Ceylon, and

The Japanese Red-Faced Monkey.

The Baboons.—In nearly every portion of Africa abounding in rocky hills covered with scanty vegetation may be found Baboons,—fierce of aspect, domineering in temper, strong of limb, and sometimes very ugly in countenance.

[1] *Sym-pha-lan′gus syn-dac′ty-lus.*

N. Y. Zoological Park.

DEAD GELADA BABOON.
Note the lion-like aspect.

Their noses are long and dog-like. They live on the ground, travel in troops of ten to twenty individuals, and rob grain-fields with great boldness. It is asserted by African explorers that even hungry lions prefer to let them alone. The canine teeth of an adult Baboon are so long and sharp that they are dangerous weapons. Without exception, Baboons are the most fierce-tempered animals of all the Primates, not even excepting the great apes, which never fight when they can run away.

All told there are about sixteen species of Baboons, all of which are found in Africa outside of the dark forests of the equatorial regions. The great **Gelada Baboon,**[1] of Abyssinia, is one of the most remarkable of all animals. It is like a small lion, with a Baboon's feet and hands; but its wonderful grimaces are peculiar to itself.

A Baboon of average size stands 24 inches in height at the shoulders, and weighs about 45 pounds. The majority of the species are of a yellowish color, mixed with brown. The **Mandrill** is known everywhere by its brilliant blue and scarlet muzzle, and yellow chin beard.

[1] *The-ro-pith'e-cus ge-la'da.*

NEW-WORLD MONKEYS.

All the monkeys of the New World are marked by the wide space between the nostril openings, and nearly all the larger species possess prehensile, or grasping, tails that are as useful as a fifth arm and hand. Most of the species which do not have prehensile tails are quite small. Of the clinging-tailed monkeys there are three important groups, which are represented in North America. They are the Sapajous, the Spider Monkeys and Howlers.

The American monkey most frequently seen in captivity is the **White-Throated Sapajou**[1]

WHITE-THROATED SAPAJOU.
Note the wide space between the nostrils.

(sap'a-jew) or **Cap'u-chin,** called by animal dealers and showmen, the "Ring-Tail." This monkey is a kind-spirited and affectionate little creature, and rarely gives way to bad temper.

[1] *Ce'bus hy-po-leu'cus.*

It has a wrinkled and care-worn face, as if burdened with sorrows—which most captive monkeys certainly are! Its forehead, throat and shoulder-points are white, and the remainder of the body is either gray, brown or jet black. The Sapajous inhabit Central America and northern South America. About two hundred specimens are brought to New York every year,

BLACK-FACED SPIDER MONKEY.
At'e-les a'ter.

where they are sold by dealers at prices ranging from $10 to $15 each.

The Spider Monkeys[1] may easily be recognized by their very long, slender legs and tails, and small, round heads. In color they are usually either black or gray, and rarely reddish brown. As they swing on their way through life, always using their prehensile tails to cling or to swing by, they have a very uncanny look, and it is no wonder that they are called "Spider" monkeys. They can come as near tying themselves into knots as living mammals ever can.

[1] *At'e-les.*

When fully grown, they are much larger than the sapajous, but are weak, unable to fight and therefore timid. In a cage containing several species of monkeys, they are always the greatest cowards, and often are heard shrieking from fright at imaginary terrors. They are dainty feeders, and very difficult to keep in health in captivity. Four species are found north of Panama. The **Mexican Spider Monkey** occurs up to Lat. 23°, and is the most northern monkey on this continent.

The Owl Monkeys.—Next to the spider monkeys is found a group often represented in captivity, the members of which are distinguished by their small size, their round heads, very large, owl-like eyes, and long, hairy tails, which are not prehensile. As their staring eyes suggest, these creatures are of nocturnal habits, and in daylight hours are as inactive and uninteresting as opossums. Because of this, they make rather uninteresting pets; but being good-tempered creatures, they are frequently kept. They are sometimes called **Do-rou-cou'lis.** They are found from Central America to southern Brazil.

The Squirrel Monkeys of northern South America and Central America are next in order, and in activity and general liveliness of habit they make up for all that the owl monkeys lack. They are the most active of all the small American monkeys, and so nervous and unmanageable they are unfit for captive life elsewhere than in cages. The **Common Squirrel Monkey,**[1] sometimes, though erroneously, called the **Teetee,** is a trim little yellow fellow, with a very long cranium, close-haired head, and a very long tail, which it gracefully curls up over its own shoulders whenever it sits down. This species comes from the Guianas and Venezuela, and is very common in captivity.

On board ship a Squirrel Monkey of my acquaintance once furnished constant entertainment and amusement. Its favorite food was big, fat cockroaches, contributed by the sailors from their collection in the forecastle. Each morning a sailor would bring a jacket, and shake it over a clear space on the deck. As the cockroach shower struck the deck, the agile little monkey dashed at the insects like a terrier at rats, cramming them into his mouth as fast as

[1] *Sai-mi'ri sci-u're-a.*

possible, and meanwhile seizing and holding in his hands as many more of the struggling insects as his absurd little paws could grasp.

This creature is a skilful climber, and it is the only mammal I ever saw which could exert sufficient lateral pressure with its hands and feet to enable it to climb with ease a perfectly smooth, right-angled corner of wood to a height of six feet.

This particular animal was so fond of its owner that it loudly and vociferously refused to sleep elsewhere than in his bunk, cuddled against his feet. With its piercing cries it controlled the situation as effectually as any spoiled child.

The Saki Monkeys, of tropical South America east of the Andes, are of medium size, mostly black and shaggy-haired, and sometimes possessed of a *long, black chin beard.* They are always marked by their big, heavily-haired tails, which are long, but not prehensile. They are often mistaken for howling monkeys. They are difficult to keep alive, seldom live to reach the United States, and for this reason are likely to remain but little known. The most remarkable species is the **Black Saki,**[1] two specimens of which were placed on exhibition in the New York Zoological Park in 1903.

The Uakari, or **Yarkee, Monkeys,** of which there are three species, all found in Brazil, have the shortest tails to be found amongst American monkeys. The **Bald Yarkee**[2] of the Upper Amazon is an excellent imitation of the Japanese red-faced monkey, having not only the same stubby tail, and long, shaggy hair, but also a *red face!* Unfortunately this species is one of the rarest in all America.

The Howlers are rarely seen in captivity, because it seems almost an impossibility for man to find food which they will eat, and which agrees with them.

Between the two sides of the lower jaw, the Howler possesses a large sound-box of cartilage —a development of the hyoid bone—which gives to the creature's voice a deep resonance, of a very unusual character. These monkeys delight to indulge in vocal concerts, and the deep roar of their unearthly voices can be distinguished at a distance of a mile or more.

In all there are six species of Howling Monkeys. Occasionally young specimens of the **Golden Howler** are brought from Venezuela and Guiana to New York, but in confinement their digestive organs are easily disturbed, and they seldom, if ever, live to reach maturity.

[1] *Pi-the'cia sa-tan'as.* [2] *U-a-ka'ri-a cal'va.*

THE FAMILY OF MARMOSETS.

Callithricidae.

Lowest in the scale of all the American monkeys, and in fact next to the lemurs, we find a collection of small and odd-looking creatures, some of which are so strangely formed that it often is necessary to state that they belong to the Order of Apes and Monkeys. This is the Family of **Marmosets,** the members of which are distributed variously from southern Mexico to southern Brazil. They are frequently found in the stores of animal dealers, and by ladies who have abundant time for their care are often

Photo. by JENNESS RICHARDSON.

COMMON MARMOSET.

prized as household pets. But they are very delicate, and do not long endure the strain of being on public exhibition. Their market price varies from $3.50 to $8.

Without exception these are all very small,

delicately-formed creatures, with hairless faces, eyes that are large and bright, and long tails. Their hair is long, abundant and silky, and in some species it stands up on the top of the head like a white ruff. As these frail little creatures perch motionless in their cages, and focus their brown eyes upon the visitor, they seem more like little toys than living animals of Man's own Order. They are really very odd, picturesque and interesting.

The Pinche Marmoset[1] is a good representative of this group. It comes from the United States of Colombia, is about as large as a small chipmunk, and can be recognized anywhere by the jaunty bonnet of white hair which stands stiffly erect on the top of its head.

Of marmosets there are altogether about twenty-one species. The best-known are the **Common Marmoset,**[2] with a fan of white hairs standing stiffly erect above each ear, and the **Silky Marmoset,**[3] which is half buried in a mop of long, silky, yellowish hair.

THE SUBORDER OF LEMURS.

Lemuroidea.

On the great island of Madagascar there are no fewer than thirty species of lemurs, many of them very beautiful creatures, all very kind-spirited and inoffensive, and so numerous that some travellers have declared that "every bush has its lemur." And yet, in America, these creatures are about as little known as if they inhabited Mars instead of Madagascar. During the first six months following the opening of the Primates' House in the Zoological Park, at least twenty educated and intelligent young men asked how to spell the word "lemur."

The lemurs, tarsiers and aye-aye constitute the lowest grand division of the Ape-and-Monkey Order—Primates. Their low position is due chiefly to their long, fox-like muzzles, and their teeth, which are not monkey-like. Their hands and feet, however, define their position.

The Ruffed, or **Black-and-White Lemur**[4] is the handsomest and most conspicuous animal in this strange group. It is the size of a large house cat, its tail is very long, and the creature is abundantly clothed with long, soft, silky-fine fur, jet black and pure white.

[1] *Mi'das aed'i-pus.* [2] *Mi'das ros-a'li-a.*
[3] *Cal'li-thrix jac'chus.* [4] *Le'mur va'ri-us.*

SANBORN, Photo., N. Y. Zoological Park.
THE RUFFED LEMUR.

Although lemurs have large eyes, and are supposed to be night-prowlers, they are fairly active in the daytime, and are not at all disturbed by daylight. They are charming pets, very affectionate, easily kept, and even with twenty in one large cage they do not quarrel, as monkeys are so prone to do.

Keeping Monkeys in Captivity.—Large monkeys need large cages, with means to climb and swing. Fine hay should cover the floor. Cages should always stand three feet above the floor of a room, and while the ventilation should be good, there should be freedom from draughts. The temperature should be 75°, kept as even as possible. *Food:* boiled rice or tapioca, baked or boiled potatoes, ripe bananas or apples; a little raw meat, finely chopped; dried or parched sweet corn that is easily chewed; a little stale bread; occasionally, a small raw onion. Permit no teasing; feed regularly, water frequently, and keep cages clean. When monkeys become ill, carefully ascertain their trouble, then treat them the same as one would sick children.

CHAPTER III

THE ORDER OF FLESH-EATING MAMMALS

FERAE, OR CARNIVORA

North America contains a fine array of animals belonging to the **Order Fe'rae,**[1] numbering about ninety species north of Mexico, not counting subspecies. They are divided into the following groups:

	FAMILIES.		APPROXIMATE NUMBER OF SPECIES NORTH OF MEXICO.
ORDER FERAE	THE CATS	*FE'LI-DAE*	8 Species
	THE DOGS	*CA'NI-DAE*	22 "
	THE MARTENS	*MUS-TE'LI-DAE*	46 "
	THE BEARS	*UR'SI-DAE*	12 "
	THE RACCOONS	*PRO-CY-ON'I-DAE*	3 "

THE CAT FAMILY.

Felidae.

In the order of their size, the five largest cat-like animals of North America are the following: Jaguar, Puma, Canada Lynx, Red Lynx, and Ocelot.

Of the Cat Family, the **Jaguar**[2] (pronounced Jag' you-ar) is not only the largest, but also the handsomest species in America. Of yellow-and-black Cats it stands next in size to the tiger, but in form it is not so finely proportioned as the leopard. It is of massive build, throughout, and its head is very large for the height and length of the animal. Its tail, however, is disproportionately short.

This creature has a golden-yellow coat, marked on the back and sides by large, irregular hollow islands of black, called rosettes—quite different from the smaller and more solid black spots of the leopard. Between these rosettes run the narrow lines of yellow ground-color, like the streets of an oriental city on a map. The legs, head and under-parts are marked with solid black spots. An animal of this species can always be *recognized by its large rosettes, large head, heavy build, and short tail.*

The Jaguar, which in Mexico and South America is called "el Tigre" (tee'gree), is found as far north as southern Texas, and from that region southward to the limit of tropical forests in South America. A female specimen which once lived in the New York Zoological Park, measured 48 inches in length of head and body, its tail was 20 inches long, it stood 24 inches high at the shoulders, and weighed 120 pounds. The big and burly male which murdered the female above mentioned is fully one-fourth taller, and larger in every way.

In killing pigs, cattle, horses, deer and other wild animals, the Jaguar is a fierce, powerful and dangerous beast; but, like all other wild creatures, it is afraid of man.

It is my belief that the strength of the jaws of the Jaguar is greater in proportion to its size than that of any other member of the Cat Family. Of this power we once witnessed in the Zoological Park a tragic illustration. A full-grown female Jaguar was purchased as a cage-mate for a large and powerful male, named "Lopez," from the interior of Paraguay. After two days' preliminary introduction through their cage-fronts, the two animals were placed together. No sooner had the female entered the cage of Lopez

[1] From Latin *fe-rus*, meaning a wild beast. This is a much older name than *Carnivora*, which heretofore has been generally applied to this group.

[2] *Fe'lis on'ca.*

than he rushed upon her, seized her neck between his jaws, and by a square bite crushed two of the neck vertebrae, and killed her instantly—as quickly as if her head had been cut off with an axe.

adventures with Pumas have been written and printed, but in reality this animal is less to be dreaded than a savage dog. It appears to be true, however, that it occasionally follows belated hunters or travellers, out of curiosity. It

Drawn by J. Carter Beard.

JAGUAR.

The Puma, also called **Mountain "Lion"** and **Cougar,**[1] is the most widely-known cat animal of North America. It is found in all the great western mountain ranges of the United States, in many tracts of "bad-lands" in Wyoming and Montana, British Columbia, and in the Adirondacks and Florida. Southward it ranges over table-lands and through tropical forests, all the way to Patagonia. In the United States it is most abundant, and also most accessible, in Routt Co., Colorado, where it is easily found by dogs, chased into low trees, and shot without danger. In this manner Mr. John B. Goff has killed nearly three hundred Pumas, "only two of which fought courageously."

Hundreds of thrilling stories of (imaginary)

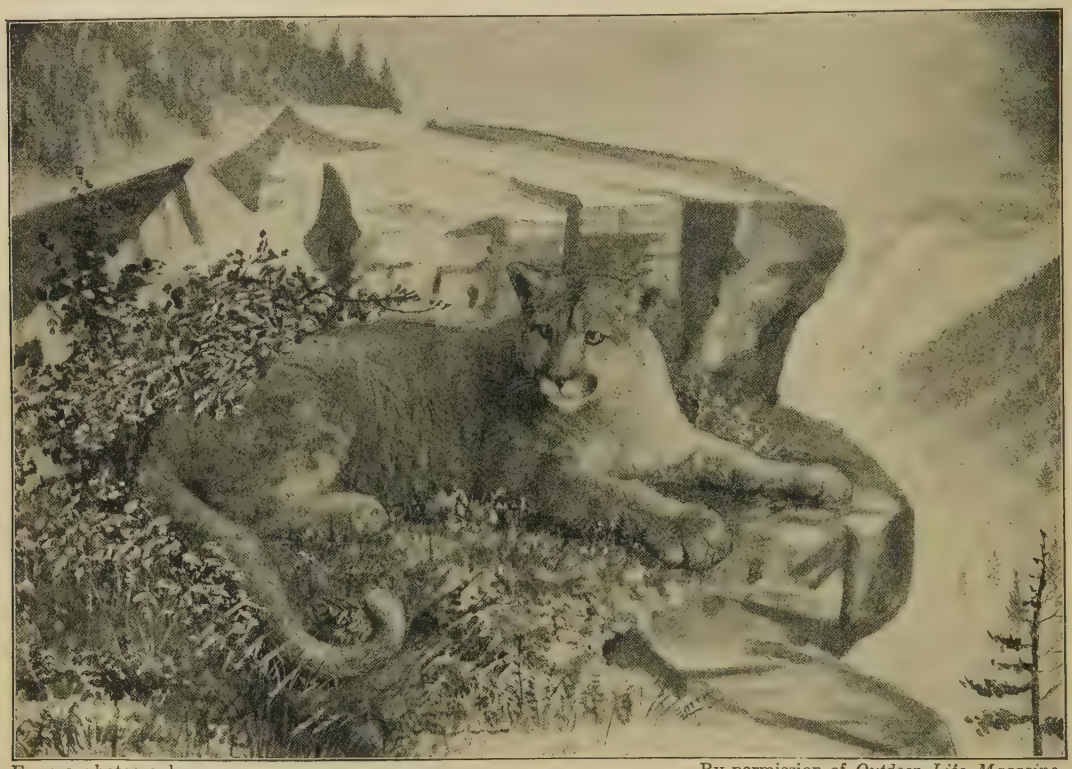
[1] *Fe'lis con'co-lor*, and other species and races recently described.

is now a well-established fact that prowling Pumas do sometimes scream, in a manner calculated to inspire terror, just as caterwauling cats frequently do. I have heard Pumas scream precisely like terrified women or boys, but they always flee from man when the way is open.

The Puma is *a thin-bodied, flat-sided animal, tall for its weight, and of a brownish drab color.* It has a beautiful face, and is a handsome creature. Of all the large cats of the world, it is by far the best climber. A large specimen is from 7 to 8 feet in total length, from nose to tail tip, and weighs about 225 pounds.

The Puma makes its den among rocks, in "wash-out" holes, or in very thick brush or forests, and preys upon every living creature that can be killed and eaten, except man. In settled regions they frequently destroy much young

stock. Throughout the Rocky Mountains, it is a dangerous enemy of the mountain sheep and mule deer. In the "bad-lands" of Montana I once saw a mule deer killed which had on its neck a twelve-inch scar, a torn ear, and the beam of one antler broken off half-way up. Apparently these injuries were received in an encounter with a Puma, and a fall over a cut bank, which evidently released the deer from its savage assailant.



From a photograph. By permission of *Outdoor Life Magazine.*

PUMA, OR MOUNTAIN "LION."

The young of the Puma vary in number from two to five, and are *spotted*. Living specimens vary in value from $30 to $75, according to age and size.

At first glance the **Ocelot,** or **Tiger-Cat,**[1] seems to be a small leopard with a pale-yellow body-color. Its legs are spotted, but instead of having spots on its body, its back and sides are marked with irregular stripes and bands of black which run *lengthwise*. It may be instantly recognized by its *horizontal stripes*, for the like are not possessed by any other animal. But no two Ocelots are ever marked exactly alike.

This animal is the size of a cocker spaniel, and being a good climber, when in its native forests it spends much of its time on the lower branches of trees, watching for prey. It feeds chiefly upon small quadrupeds and birds. The following are the dimensions of an average specimen: Height, 13 inches; head and body, 30 inches; tail, 15 inches; weight, 36 pounds. It is frequently taken in southern Texas—its northern limit—and its range is about the same as that of the jaguar. In the New York Zoological Park it has been kept out-doors all winter, and has bred and reared young very successfully. Like most small yellow cats, Ocelots are usually bad-tempered. The value of a living specimen is about $30.

The Lynxes of North America form a very distinct group of short-tailed, heavily-furred, tree-climbing cats, the members of which are spread throughout nearly all portions of the con-

[1] *Fe'lis pard-a'lis.* See page 42.

tinent north of Mexico, which are yet sufficiently wild to shelter them from man. They inhabit with equal facility forests, mountains, canyons,

Drawn by J. Carter Beard.

CANADA LYNX.

sage-brush plains, and even deserts. They prey chiefly upon rabbits and hares, grouse, prairie-"dogs," ground squirrels, and any other living creatures, except porcupines, which they can catch and kill. They are not courageous, or disposed to fight except when cornered, and so far as voluntarily attacking human beings is concerned, Lynxes are no more dangerous than rabbits.

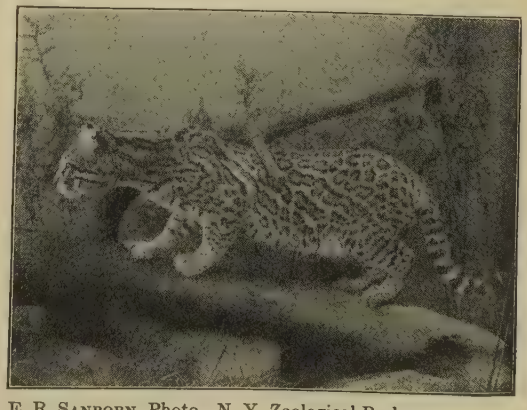
In North America the genus *Lynx* is represented by two well-marked types.

The Canada Lynx[1] is a heavily-furred, short-bodied, long-legged bob-tailed wild cat of a pepper-and-salt gray color, standing about 18 inches high at the shoulders. It is readily recognized by the *long pencil of stiff, black hair rising from the tip of each ear, and its huge, hairy paws.* Its big eyes and long side whiskers give it a really terrifying countenance, particularly when it snarls. To the lone hunter who camps in the dark and gloomy forests inhabited by this creature, it seems a very dangerous animal; but in reality it is not so. Those who have hunted it say it is not courageous, and at close quarters is easily killed with a stick. It is a good climber, swims well, but on land runs rather poorly, with a galloping gait. Although found in a few localities in the northern United States, its real home is in the provinces of Quebec, Ontario, and the Northwest, up to Latitude 60°. A good average-sized male specimen collected by Professor Dyche in British Columbia measured as follows: Height, 17½ inches; head and body length, 32 inches; tail, 5 inches; girth, 17½ inches.

The weight of a full-grown specimen is 22 pounds, and the young are two in number. This species is rarely seen in captivity, and is always desired by zoological parks and gardens. Living specimens are worth from $10 to $40 each.

The Bay Lynx[2] is also called the **Red Lynx, Wild Cat** or **Bob Cat,** according to the locality in which it is found. Owing to variations in its color, and in some other characters, several subspecies have been described, but these are too closely related to the type to be set forth separately here. This species is marked by the absence of the long ear-pencil of the Canada lynx (although sometimes a small pencil is present), by the small feet and the warm brown tone in the color of the fur.

Western specimens are sometimes so strongly marked with round black spots that we feel impelled to recognize the "Spotted Lynx" as a distinct species; but when we find others from the Atlantic coast also spotted, besides others of the standard reddish gray, we are compelled to refer all of them to the species of the Bay Lynx. In the Atlantic states, the standard color for this



E. R. Sanborn, Photo., N. Y. Zoological Park.

THE OCELOT.

animal is a mixture of rusty red, gray and blackish brown, with the red so prevalent as to have given a name to the creature. In the West, the

[1] *Lynx can-a-den'sis.*

[2] *Lynx ru'fus.*

spotted coat is more common, and occasionally the spots are strongly marked all over the animal.

The face of the Bay Lynx is really very beauti-

BAY LYNX.

ful, and when not too fat from overfeeding in captivity, the body is lithe and graceful. When kept in large cages in the open air and sunlight, sheltered from storms, and not overfed, this animal is easily kept in fine condition. In artificially heated buildings they do not thrive.

This species is found in nearly all the states east of the Mississippi which contain large areas of rough forests, but are most numerous in Maine, the Carolinas, Florida, Virginia and Tennessee. In the "bad-lands" and mountains of Montana, Wyoming, Colorado and Texas they are really numerous, and feed luxuriously on the cottontail rabbits that are now so abundant in that region. Varieties of this species extend westward to the Pacific coast states. East of the Mississippi River, an average of about twenty specimens are caught alive each year, and offered for sale. Their value when caught is $10 each, and the supply exceeds the demand.

By measurement the Red Lynx is fully as large as the Canada lynx. The largest specimen that ever came into my hands (on Pryor Creek, Montana) measured in length of head and body 31 inches, tail 7 inches, height at shoulder 18 inches, and weighed 18 pounds. The largest of nine specimens killed by Mr. Roosevelt's party in Routt Co., Colorado, in 1901, weighed 39 pounds. One killed near Asheville, North Carolina, in 1900, is reported to have weighed 51 pounds.

No lynxes are found in the lowlands of the tropics, or in South America.

THE DOG FAMILY.

Canidae.

Of all the wild creatures of North America, none are more despicable than wolves. There is no depth of meanness, treachery or cruelty to which they do not cheerfully descend. They are the only animals on earth which make a regular practice of killing and devouring their wounded companions, and eating their own dead. I once knew a male wolf to kill and half devour his female cage-mate, with whom he had lived a year.

In captivity, no matter how well yarded, well fed or comfortable, a wolf will watch and coax for hours to induce a neighbor in the next cage to thrust through tail or paw, so that he may instantly seize and chew it off, without mercy. But in the face of foes capable of defence, even gray wolves are rank cowards, and unless cornered in a den, will not even stop to fight for their own cubs.

GRAY WOLF.

The Gray Wolf, or **Timber Wolf,**[1] is really a formidable animal, but in its dealings with men,

[1] *Ca'nis oc-ci-den-tal'is.*

it has learned to fear the deadly rifle, the poison pot, and the trap. Storms, cold and fatigue affect it but little, and its powerful teeth, strong jaws and wide gape enable it to bite with great cutting power. In fighting with dogs, every well-aimed snap means either a deep wound or a piece of flesh bitten out.

The type of this species is a strong, robust animal, cunning and merciless. Its winter coat is long, shaggy and coarse-haired. Its standard color is mixed black and white, but it varies greatly, and unaccountably. In Florida it is often black, in Texas reddish brown, and in the far North it varies from black to white. Although in some localities it is called the Timber Wolf, it is equally at home on the treeless prairies of the West, in the dark, evergreen forests of British Columbia, and on the desolate barren grounds of Arctic America.

Although once very abundant on the great plains, the coming of the cattle ranch and sheep-herder provoked against the Gray Wolf and coyote a relentless war of extermination, which still is being waged. Several states in the cattle country of the great plains offer cash bounties on wolf scalps ranging from $2 to $10, and large sums of money have been paid out for them. In Montana the number of wolves has so greatly diminished that in the course of a month in the saddle in 1901, in wild country, no Gray Wolves were seen, and only four coyotes. Wolves have now become so scarce that the occupation of the professional "wolfer" is almost gone.

Nevertheless, even on the cattle plains, the Gray Wolf is very far from being extinct; and as long as the "bad-lands" remain, with their thousands of wash-out holes, and tens of thousands of rabbits, the gray marauder will remain. In the far North, above the Arctic Circle, and in the land of the musk-ox, in 1899, Mr. C. J. Jones and his companion were so beset by packs of huge and fierce White Wolves, seeking to devour their five living musk-ox calves, that for over forty-eight hours they fought them continuously at short range, killing a wolf at every shot.

The young of the Gray Wolf are usually five in number, and are born early in May. At first they are of a sooty brown color, and are distinguishable from coyote puppies by the large size of the head. One which was examined when four days old measured $9\frac{1}{2} + 3$ inches, and weighed 16 ounces. When twenty days old, it was $15 + 4$ inches, and weighed $4\frac{1}{2}$ pounds.

The cry of the Gray Wolf is a prolonged, deep-chested howl, corresponding with B-flat below middle C, not broken into a bark, like the cry of the coyote. When seen at home, the Gray Wolf can readily be distinguished from the coyote, even at a distance, by the way it carries its tail,—pointing above the horizon.

Gray Wolves hunt in packs, often in relays, and successfully pull down deer, antelope, and wounded animals of all sizes. In the cattle country their specialty is the destruction of calves and colts. Except in the far North, they know well what firearms are, and are very careful to keep out of rifle-shot.

N. Y. Zoological Park.

COYOTE.

To-day the range of the Gray Wolf embraces the Great Plains and the Rocky Mountain region from Mexico to the northern limit of land. Lockwood and Brainard found tracks of a Gray Wolf at Latitude 83° 24′. In Alaska, animals of this species grow larger than in the United States, and frequently are white instead of gray. A fairly large Gray Wolf is $48\frac{1}{2} + 15\frac{1}{4}$ inches long, stands 26 inches high at the shoulders, and has a girth measurement of $29\frac{1}{2}$ inches. (L. L. Dyche.)

The Coyote, or Prairie Wolf,[1] is about one-third smaller than the gray wolf, but in form and color the two species look very much alike. It carries its tail low—humbly—as befits a cow-

[1] *Ca'nis la'trans*, and related forms.

ardly animal. It is not dangerous to man, and never was, and is bold only in the persistence with which it hangs upon the outskirts of civilization, and prowls around ranches in quest of food.

The delicacy of the Coyote's judgment in keeping always beyond fair gun-shot is truly wonderful. If he is not a mind-reader, his actions belie him. Twice in Montana, each time for two weeks, have I tried my utmost to shoot a Coyote; but during those periods not one would offer more than a running shot at three hundred yards or more. Twice, however,—and immediately after the above,—when riding quite unarmed, have Coyotes sat down beside the trail, waited for me to approach within forty yards, then yawned in a bored manner, and slowly trotted off. It is my belief that those animals knew perfectly well my inability to shoot.

The food of Coyotes consists chiefly of prairie-"dogs," ground-squirrels, sage grouse, hares and rabbits. The largest animals ever killed by them are deer and prong-horned antelope. From the ranchman they steal poultry, pigs, lambs and sheep. They "den" in "washouts," or deep holes in the cut banks of ravines, and rear from five to seven puppies every May.

The cry of the Coyote is a dog-like yelping, half howl and half bark; whereas, the call of the gray wolf is a prolonged and steady deep-bass howl. As far as they can be heard, these wolves can be distinguished by their cries, and to those who have camped on the plains, or in the wild and weird "bad-lands" of the great West, the high-pitched, staccato cry of the Coyote as he announces the coming dawn, is associated with memories of vast stretches of open country, magnificent distances, fragrant sage-brush and freedom. The specific name of this animal (*latrans*) means "barking," and was bestowed on account of its peculiar dog-like cry.

The Coyote ranges from the latitude of the City of Mexico northward through the Great Plains and Rocky Mountain region to Alberta. The size of my best Montana specimen was $37\frac{3}{4} + 16$ inches in length, and $20\frac{3}{4}$ inches in height at shoulders.

Coyotes vary in color from the typical pepper-and-salt gray to yellowish gray, the latter being found in the Southwest. At rare intervals, black specimens occur.

NORTH AMERICAN FOXES, north of Mexico.

GENUS.	ENGLISH NAME.	LATIN NAME.	LOCALITY.
Red Fox Group: Genus *Vulpes*.	**Red Fox,**	*Vulpes fulvus* (Desmarest).	Virginia to Alaska.
	Cross Fox,	*Vulpes fulvus decussatus* (Desmarest).	New York to Manitoba.
	Black Fox,	*Vulpes fulvus argentatus* (Shaw).	Northwest Territory, Alaska.
	Plains Fox,	*Vulpes macrourus* (Baird).	Great Plains.
	Kadiak Fox,	*Vulpes harrimani* (Merriam).	Kadiak I., Alaska.
	Newfoundland Fox,	*Vulpes deletrix* (Bangs).	Newfoundland.
	Swift Fox,	*Vulpes velox* (Say).	The Great Plains.
	Large-Eared Fox,	*Vulpes macrotis* (Merriam).	Southern California.
	Arctic, or Blue Fox,	*Vulpes lagopus* (Linnaeus).	Polar regions of both hemispheres.
	Hall Island Fox,	*Vulpes hallensis* (Merriam).	Hall Island, Bering Sea.
Gray Fox Group: Genus *Urocyon*.	**Gray Fox,**	*Urocyon cinereoargenteus* (Schreber).	Southeastern States.
	Florida Gray Fox,	*Urocyon cinereoargenteus floridanus* (Rhoads).	Florida.
	Scott's Gray Fox,	*Urocyon cinereoargenteus scottii* (Mearns).	New Mexico to Southern California.
	Texas Gray Fox,	*Urocyon cinereoargenteus texensis* (Mearns).	Texas.
	Coast Gray Fox,	*Urocyon cinereoargenteus californicus* (Mearns).	Southern California.
	Townsend's Gray Fox,	*Urocyon cinereoargenteus townsendi* (Merriam).	Northern California.

The Red Fox.[1]—Of the many handsome and valuable species of foxes inhabiting North America, our wise old friend, the Red Fox, is the one most widely distributed, and the best

SANBORN, Photo., N. Y. Zoological Park.

RED FOX.

known. Between the southern Alleghenies and Point Barrow it appears in coats of many different shades, but everywhere it is recognizable by the prevailing yellowish-red color from which it derives its name. It is palest in the desert regions, where shade is scarce, and brightest in the forest regions and Alaska, where the bleaching power of the sun is not so great. The largest and finest skins come from Alaska.

The range of the Red Fox is very wide. From North Carolina and Tennessee it extends through the whole northeastern United States, westward to Montana and northward to the limit of trees. It is the most common fox in Alaska, wherever there are trees. It is so cunning, and so well able to take care of itself, even in populous countries, that it refuses to be exterminated. The length of an average specimen is 24 + 13 inches; height, 13 inches.

There is little pleasure to be derived from foxes kept in captivity as pets. They are very nervous, easily frightened, and, as a rule, are totally lacking in all the sentiments which resemble affection. Nevertheless, we have seen, and also owned, Red Foxes that were tame, and trustworthy when handled.

The Cross Fox is really a color phase of the red fox, marked by black legs and under parts, a dark-colored cross on the shoulders, steel-gray body and head, and a big black tail with a snow-white tip. There is a reddish patch behind the fore-leg, and another on the side of the neck. In my opinion a really typical Cross Fox is the handsomest fox in the world, far more beautiful than the much-sought "silver fox." Some day it will attract the appreciation it deserves, and be sought accordingly. It stands between the red and the black foxes, and grades into both. It is found in Manitoba, Alberta, British Columbia, and Alaska, and occasionally in Idaho and Utah.

[1] *Vul'pes ful'vus.*

The Black Fox, commonly called the "Silver Gray" Fox (although there is no silvery color about it, save its tail-tip), enjoys the distinction of having the highest price on his head that is offered for any fur-bearer. In March, 1900, a single skin of this animal sold at auction in London for $2,784; and it is not at all uncommon for extra fine skins to sell in this country at from $600 to $1,200. They are worth so much as furs for the very wealthy that zoological gardens cannot afford to purchase live specimens for exhibition. Their exhibition value is far below their fur value.

Like the cross fox, this is only a color phase of the typical red fox, but commercially the two forms are so distinct, and so sharply defined in dollars and cents, that they demand separate notice.

Drawn by J. CARTER BEARD.

BLACK, OR "SILVER" FOX.
A subspecies of the Red Fox.

With the exception of its snow-white tail-tip, and a few scattering white hairs on the top of the hind quarters, a typical Black Fox is jet black. This form inhabits the same localities as the cross fox, and is much given to mixing with it, which causes many variations from their

standard colors toward the typical red fox. Both these animals are somewhat larger than the typical red fox found in New England.

Fox Farming.—The breeding of the very valuable Black Fox in captivity on a sound commercial basis has at last become an established industry. Domestic-bred skins now are regularly found in the fur markets. Black fox farms are scattered all the way from Prince Edward Island to New Jersey, and westward through the northern States to Oregon and British Columbia. Prices have become so stabilized that the industry easily is extended. The industry maintains at Seattle, Washington, a very instructive magazine called *Fox Farming*. The literature of this industry is already quite plentiful.

The Swift Fox, or **Kit Fox,**[1] is the smallest and daintiest of all our foxes. Its color is a beautiful silver-gray, with a tinge of yellow. It is strictly an inhabitant of the Great Plains region from the Rio Grande to the Saskatchewan, but owing to the readiness with which it eats poisoned meat that has been put out for wolves, it has already become very scarce. In spite of its name, it does not run with remarkable swiftness.

The Arctic Fox.[2]—This creature of the polar world is a striking example of climatic influence on a species, and also of the danger that lies

ARCTIC FOX.

in describing a species from a single specimen. In the far North, the Arctic Fox is snow-white all the year round. Farther south it is white in winter, but in summer is bluish-brown. In the southern part of its range, the Aleutian Archipelago for example, except for an occasional white individual, it is dark all the year round, and is known only as the **Blue Fox.** At first it may seem difficult to believe that these two widely-different extremes are only color-phases of the same species; but it is quite true. The dark-colored animal is not even accorded subspecific rank.

The Arctic-Blue Fox is a simple-minded creature, of sanguine temperament, easily trapped and handled, and ever ready to adopt the prepared food of civilization. In its white phase, the finest skins sell in London at $12 each. In its blue-brown coat, it has a very comical countenance, characterized by much hair, close-cropped ears, and a total absence of beauty; but its fur, when taken in season, is worth in the London market from $25 to $50 per skin.

On various islands along the Alaska coast, especially in the Aleutian Archipelago, about forty commercial companies are engaged in breeding Blue Foxes for their fur, some of them with satisfactory success. The foxes are fed daily, on cooked corn meal and dried fish. They come up to be fed, and when the time comes to handle and sort them previous to killing the annual allotment, they greatly facilitate matters by the readiness with which they enter box traps.

In the New York Zoological Park, three pairs of Blue Foxes that were received in 1902 from Alaska have taken kindly to captivity. The great decrease in the annual supply of good fur has caused many persons to hope that fox-breeding may be developed into a remunerative industry. Except in Alaska, no successful experiments in that line have been made, and it is quite desirable that fox-breeding in the United States should be taken up under state or national auspices, and wrought out to a successful issue. There is good reason to hope and believe that it might be developed into an important industry.

The Gray Fox[1] is the fox of the South, but it ranges northward far into the home of the red fox. It is noticeably smaller than the latter, pepper-and-salt gray above, and rusty-brown underneath, with a red patch on the side of its neck. For a fox it is very agile, and when hard pressed by dogs it can climb small trees up to a height of twenty feet or more.

[1] *Vul'pes ve'lox.* [2] *Vul'pes la-go'pus.*

[1] *U-ro-cy'on cin-e're-o-ar-gen'te-us.*

The five subspecies of the gray fox extend throughout the southern United States from Florida to California.

Besides the foxes already mentioned, several other species and races are recognized.

SANBORN, Photo., N. Y. Zoological Park.

GRAY FOX.

THE SMALL FUR-BEARERS.

Mustelidae.

A majority of the valuable fur-bearing animals of North America are found in a group of flesh-eaters known as the Marten Family. It contains about fifty full species, and its conspicuous types are the following:

THE MARTEN FAMILY: *Mustelidae.*

- Otter; Mink; Weasel; Marten; — These four types are marked by long, slender bodies, very short legs, flattened heads, and general activity on foot.
- Wolverine; the greatest glutton and pest in this Family.
- Skunk; aggressive and destructive pests; valuable fur-bearers.
- Badger; a fat-bodied, inert and practically harmless burrower.

The great demand for fur, both for ornament and use, has brought about the systematic destruction of all fur-bearing animals. Many species that once were numerous have now become very rare. Formerly the wearers of fur accepted nothing less desirable than beaver, otter, mink and marten. To-day, the fur of the skunk, raccoon, fox, lynx, black bear and even the despised rabbit are in active demand, for garments and for trimmings.

The Otter[1] is as fond of water as a seal, and quite as much at home in fresh water as on land. Its regular food consists of fish, in the capture of which it is very expert. It has webbed feet, a thick, pointed tail distinctly flattened for use in swimming, and it is clothed with a thick coat of very fine, dark brown fur. Strange to say, when fairly treated, the Otter is a good-tempered animal, tames easily when caught young, and makes an interesting pet. In a public park, one Otter is worth more to the public than twenty beavers.

In the days when they were numerous, and less persecuted than now, it was no uncommon thing for a party of Otters to select a steep and slippery river-bank, and slide down it repeatedly, as small boys slide down hill on sleds, except that each slide of the Otter always ended in a plunge into the water.

The Otter of North America still is found occasionally in Florida and the Carolinas, the Canadian provinces, in a few localities in the Rocky Mountain region, and from British Columbia to central Alaska. Outside of Alaska, its fur is taken so rarely that it has ceased to be regarded as an article of commerce. Its value alive for exhibition purposes is from $10 to $30. The length of a large northern Otter, head and body, is 27 inches and tail 16 inches.

The Otter builds no house, but lives in a bank burrow, usually under the spreading roots of some large tree growing near the water. The young are usually two in number.

The Sea Otter,[2] one of the most valuable of all fur-bearing animals, is literally a child of the ocean surges and the surf-beaten rocks of the rugged north Pacific coast. It is born at sea, on a bed of kelp, and literally "rocked in the cradle of the deep." It was formerly found from California to the Aleutian Islands, but is now very rare except in certain parts of Alaska. Here its pursuit is strictly limited by law to the natives, to whom it is vitally important, and a white man may not kill a Sea Otter except under penalty of a fine of $500.

[1] *Lu'tra can-a-den'sis.* [2] *La'tax lu'tris.*

The fur of this creature is extremely valuable. In March, 1900, the finest skin in the London market sold for $1,344. A full-grown specimen measures from 3½ to 4 feet in length (head and body) and has a tail 11 inches long. Its fur is very dense and fine, and in color is a shimmering, lustrous black. The pursuit of the Sea Otter usually is quite dangerous, but to the natives of the Alaskan Peninsula, this creature is far more important than the fur seal. Formerly between five thousand and six thousand skins, worth from $100 to $500 each, were taken annually, and formed practically the sole dependence of the natives along nearly 2,000 miles

1. OTTER.
2. FISHER.
3. MARTEN.
4. MINK.

of coast line. But with the introduction of fire-arms, and the sealing schooners, the Sea Otter has been almost exterminated. The few individuals that remain are widely scattered, and are the wildest and wariest of all wild creatures.

The Mink [1] is much smaller than the otter, yellowish brown or dark brown in color, and while it prefers to live along the banks of streams, it is not an aquatic animal like the otter. When possible, it feeds chiefly upon birds, because they are easily caught and killed, and when opportunity offers, it is a wanton murderer. It also preys upon small mammals and fish, whenever it can procure them. In the Beaver Pond of the New York Zoological Park a murderous Mink once killed six wild geese in one night, and another slaughtered ten herring gulls.

A full-grown Mink looks very much like a large weasel, having a long, slender body and very short legs.

The Mink is by no means as rare as the otter, and even to-day is found scattered throughout nearly the whole of North America, as far as the limit of trees. The round, hairy tail, chocolate-brown or yellowish-brown color and smaller size of this animal quickly distinguish it from all other animals of its Family. The body of a full-grown specimen is about as thick as the wrist of a medium-sized man. The length of the head and body is 19 inches, tail 7 inches.

The Black-Footed Ferret, [2] of Kansas, Colorado, Wyoming and Montana, is to many persons who live in its home country, an enigma. In 1849 this pretty creature was described and illustrated by Audubon and Bachman, after which it totally disappeared, and remained a mystery until it was re-discovered in 1886. In its home it is often called the **Prairie-"Dog" Hunter,** because its specialty is the killing of prairie-"dogs;" and it is nearly always found in the towns of that jolly little animal. It can be recognized at a glance by its black feet, brown legs and black tail-tip, and the cream-yellow color of its head and body. Next to the skin, the fur is white, and there is a broad black or dark-brown patch across the nose, including both eyes. Its length of head and body is 19 inches, tail 4 inches. Regarding its habits and life history, much remains to be ascertained by the young naturalists who live in the country it inhabits.

[1] *Lu-tre-o'la vi'son*, and related species.

[2] *Pu-to'ri-us nig'ri-pes.*

The Weasel, of which many species and races have been described, is the smallest animal in the marten family.[1] Its legs are very short and far apart, and its body is no thicker than a

BLACK-FOOTED FERRET.

man s thumb, but it is of such great length that the animal is positively snake-like in its proportions. In life it is very odd to see the front legs walk to and fro quite independently of the hind quarters. Fifteen full species have been described, several of them being very much alike. The **Common Weasel**, or **Ermine** [2] is brown in summer, and white in winter.

The Weasel is one of the most courageous and aggressive of all animals. It kills rabbits, grouse, chickens and ducks of ten or twelve times its own size, and often kills ten times as many chickens as it can eat, purely to gratify its murderous disposition. It is as savage as a tiger, but on farms it often does good service in destroying rats and field-mice. Weasels are so small their fur has little value, but the time is coming when it will eagerly be sought and used.

[1] The Least Weasel (*Putorius rixosus*), which is found from the Saskatchewan to Alaska, is said to be the smallest carnivore in the world.

[2] *Pu-to'ri-us er-min'e-a.*

The Marten[1] looks very much like a young red fox, and in size it is about as heavy as an ordinary domestic cat. Its head and body length is 17 inches, and its tail 7 inches. The body is brownish yellow, the legs are two or three shades darker, and it has three kinds of hair. It loves timber, and spends much of its time in trees. It is rarely found in open country, and is most abundant on rugged and rocky forest-covered mountains.

The Marten is not a poultry-killer, nor a wanton murderer of more game than he can eat, but he lives by honest hunting of wild game. His food consists of small rodents, birds, eggs, or even an occasional reptile. In the United States this animal is now rare, for its fur has always been highly prized. It is often called the **Pine Marten.**

The Fisher, or **Pennant's Marten,**[2] is one of the largest members of the Marten Family in America. It is a bold, active tree-climber, an industrious hunter, an aggressive fighter, and as a stealer of baits it is almost as great a nuisance to trappers as the hated wolverine. With this animal, "all's fish that cometh to net," and with equal relish it devours dead fish, rabbits, squirrels, chipmunks, ground birds, snakes, toads and frogs. Occasionally it murders its own cousin, the pine marten, and even feeds upon the Canada porcupine.

The Fisher is at home in the swamps or the rocky mountain-sides of northern New York, and in the forest regions of North America generally from Maine and southern Labrador to the Pacific coast. Northward it ranges to Great Slave Lake and the Yukon River. In color it varies from glossy black to dark brown, with occasional gray, or grayish white, on head and neck, chin, chest and abdomen. Its average length is 23 + 14 inches. The young vary in numbers from two to three.

THE WOLVERINE.

[1] *Mus-te'la americana.* [2] *Mus-te'la pen'nant-i.*

The Wolverine, or **Carcajou,**[1] is one of the most remarkable animals in North America. It is about the size of a full-grown bull-dog, has a ravenous appetite, great strength, a fierce temper, and the combined cunning of many generations of criminals. It is the greatest thief amongst animals, and is such a greedy feeder that it is known to many as the **Glutton.** It will follow a trapper's "line" of marten traps, for miles, destroy every animal it finds in them, devour baits, and sometimes steal the traps also.

It breaks open caches, raids cabins, and systematically destroys everything it encounters. It is the only animal living which maliciously and deliberately destroys property, and soils food which it can neither eat nor carry away. It steals articles which it cannot possibly use, and more than once has been known to strip a cabin of nearly its entire contents.

In form this animal resembles a cross between a badger and a bear. In Wyoming it is called the *Skunk-Bear*, and in Washington the Indians call it the *Mountain Devil.* It inhabits the northern Cascades and the Rocky Mountain region of the United States as far south as Great Salt Lake, and the whole of arctic and subarctic America to the northern limit of trees. It is especially abundant on the Kuskowim River, Alaska. Its length is 32 x 10 inches.

The Skunks form a large group, widely distributed, but all the species, however much they differ in size or color, are arranged in three genera.

COMMON SKUNK. LITTLE SPOTTED SKUNK.

The Common Skunk,[1] of which nine species are recognized, is very well known, chiefly because of its powerful odor, its wide distribution, and its very conspicuous jet-black color, divided on the back by one or two broad bands of white.

This type of skunk is practically confined to the United States and Mexico, and is most abundant in the North. The very offensive fluid which constitutes its defence against all

[1] *Gu'lo lus'cus.*

[1] *Meph'i-tis.*

enemies, is contained in two glands situated near the base of the tail, and can be thrown several feet. Its odor is so offensive and so stifling that neither man nor beast can long endure it.

The Skunk is a bold marauder, and destructive to poultry, but nevertheless of value as a destroyer of white grubs and other noxious insects. Owing to the disappearance of the otter, beaver, mink and marten, the fur of the Skunk has become valuable, and is now very extensively used, the white portions being first dyed black.

The Little Spotted Skunks [1] are found chiefly in our southern states, and can immediately be recognized by the alternating bands of black and white which extend lengthwise along the body. Of these there are about a dozen species, but some of them are very much alike. They range from the Gulf coast north to West Virginia and Kansas, but on the Pacific slope they are found in Washington, Oregon, California and Utah.

The Badger Skunks [2] resemble the common Skunks in size, but may be readily distinguished by the broad white stripe on the back, and the powerful claws on the fore feet. As indicated by their name, they are more badger-like than

THE BADGER.

the other skunks, and are expert diggers. They are the only skunks which occur in South America, and their range extends from the Straits of Magellan northward along the west coast, through Central America and Mexico into southern Texas and Arizona.

The Badger is an animal of strange form, its body being very broad and flat, and its legs very short. In size it stands midway between the common skunk and the wolverine. It has a savage and sullen disposition, and as a pet is one of the worst imaginable. It lives in burrows, and feeds on ground squirrels, prairie-"dogs," and ground game of every description. Often Badgers will be found living in deserts where it would seem an impossibility for any carnivorous animal to find a supply of food. Its home is the Great Plains, the Rocky Mountains and westward thereof to the Pacific coast, from Mexico to Manitoba and Alaska.

[1] *Spi'lo-gale.* [2] *Co-ne-pa'tus.*

THE BEAR FAMILY.

Ursidae.

That nearly all young people, the whole world over, are greatly interested in bears, is no cause for wonder. Under proper conditions, young bears are the most merry-hearted wild animals that come into captivity, not even excepting monkeys, and in some respects the most interesting. Of all wild animals kept in zoological parks, there are none that more fully repay the care bestowed upon them, and excepting apes and monkeys, none that furnish more amusement. With plenty of sun-lit space in which to romp and play, good bathing pools, and no stone walls to depress their spirits, *if not fed by visitors*, bears are more playful and mirth-provoking than most monkeys. If immured in gloomy "bear-pits," or confined in small cages, their spirits are correspondingly depressed. They are then like unhappy prisoners, rather than care-free wild creatures. If tantalized with bits of food, they quarrel and fight, and their tempers become savage and dangerous.

Contrary to general belief, a bear is naturally cheerful and good-tempered. Elk, deer, buffalo, elephants and large cats often attack their keepers, but bears that have been properly reared in captivity seldom do so.

The bear dens of the New York Zoological Park, contained (in 1927) twenty-three bears, of eleven different species, living in peace and harmony, in nine paved yards. Young bears usually spend their waking hours in romping, wrestling, boxing, and swimming, and ill-temper is rarely shown. The keepers go amongst these bears with only pick-handles or brooms for defence, and the great brutes are driven to and fro

Drawn from life, in the New York Zoological Park, by J. CARTER BEARD.

ALASKAN BROWN BEAR.

From near the head of Cook Inlet, Alaska, and represents *Ursus dalli*.

as if they were so many sheep. At the same time, any visitor who is so unwise as to thrust a hand between the bars within reach of the jaws of any of the inmates is certain to be very severely bitten,—in playfulness rather than rage! In their rough play these bears continually bite each other, without inflicting injury; and they do not appreciate the difference between a tender human hand and a tough, hairy paw.

Never offer a finger to a carnivorous animal, unless you really wish to have it bitten off. And do not feed pea-nuts, candy, peaches, or tobacco to animals in captivity. If you wish to kill any of them, a gun is far more respectable, and also more merciful.

Structure and Habits of Bears.—Bears are plantigrade, or flat-footed, animals, with long claws that are not retractile. They live on the ground, and eat all kinds of food, from green grass to elk steaks. A few species only are able to climb trees. In their food habits they are om-niv'o-rous, and devour almost everything they can chew, except wood and foliage. The bears of the Alaskan coast eat great quantities of marsh grass, and berries, but salmon is their regular food. All bears eat succulent roots, insect larvae, honey, frogs and also reptiles, fish, and every other kind of flesh they can obtain. In captivity they thrive best on a variety of food consisting of stale bread, raw meat, cooked meat, rice, raw fish, boiled potatoes, raw carrots, and fruit.

In the temperate zone, where the snow falls to a depth of a foot or more, bears are unable to procure food in winter, and pass that season in a sort of sleep, or hibernation. With its stomach and intestines empty, or nearly so, a bear enters its den in December, curls up, and with some of the functions of Nature entirely suspended, sleeps until spring! In reality, the creature lives upon the fat that has been secreted under its skin and elsewhere during the summer days of good living. Ordinarily, bears in captivity that are supplied with daily food, do not hibernate in winter, but one cinnamon bear which I knew personally, at Mandan, North Dakota, dug a hole in the prairie, entered it on December 17, and did not reappear until March 14, of the following year. In the tropics, bears never hibernate.

Naturally, the dens of hibernating bears are of several kinds, accordng to conditions. In the Adirondacks, of New York, the black bear often chooses the base of a hollow tree, or digs a cavity under the roots of a tree. In the "badlands" of the West, bears easily find warm and comfortable dens in the wash-out holes of rugged ravines. In the mountains, amongst rocks, small caves are easily found. In Washington, "Grizzly" Adams caught "Lady Washington" and "Ben Franklin" in a deep den that had been dug by their mother in a steep hillside.

All the world over, two bear cubs usually constitute a litter. In America, they are usually born in January, and at birth are ridiculously small, almost hairless, and as helpless as newly-born mice. Although they grow rapidly during the first year, they are seven years in reaching full maturity. In captivity bears seldom breed and rear their young, chiefly because of the lack of satisfactory seclusion for the female. Mr. Arthur B. Baker, who has recently inquired into the habits of the American black bear in captivity, states that "at Cuyahoga Falls, Ohio, are two specimens which regularly hibernate, and also a pair, born in 1888, which, with the exception of three years, have had cubs each January (21st to 27th) up to 1903, all of which were raised, excepting a few which met death by accident."

Bears have bred in captivity in the zoological gardens and parks of Philadelphia, Cincinnati, Washington and New York, but few of the cubs have been reared.

The dimensions of a Russian brown bear cub—a species that is an excellent understudy of our silver-tip grizzly, and but slightly inferior in size—was when two days old as follows: Length, head and body, 9¾ inches, tail, ½ inch; height, 5 inches, circumference of chest, 6¾ inches; hind foot 1⅛ inches by ⅞ inch; weight 15 ounces. This cub was born on January 17.

All American bears, except the polar, show great changes in the color of their pelage at different seasons of the year. In the late summer the new pelage is darkest, but by the following spring, the old coat has grown so much lighter in color that the wearer seems like a different individual. The shedding period is from May 1 to August 1.

North American Bears.—Leaving out of count the subspecies, and the species of which we know little or nothing, the world contains fourteen well-marked types of bears. Of these, eight inhabit Asia and Europe, four are found in North America, one is found all around the north pole, and one in South America. From both the Old World and North America, quite a number of additional species and subspecies have been described; but it must be remembered that at present we are dealing only with conspicuous types.

Owing to puzzling variations in color, claws and skulls, and the great difficulty of bringing together several hundred adult skins with skulls, it is at present impossible to state precisely how many different kinds of bears inhabit this continent, or how they are related. In the near future, however, many existing questions will be settled; and until then the wisest course for the student and the general reader is to accept only well-known facts, and wait with patience for more.

The bears of North America constitute four distinct groups, as follows:

Polar Bear, of the far North. White. Very large.

Big Brown Bears, of Alaska. Light brown. Very large.

Grizzly Bears, Mexico to Alaska. Gray or brown. Medium to very large.

Black Bears, North America generally from Mexico to Alaska. Black or brown. Medium size, and large.

To most persons, the second group of this series is quite new, and for several reasons its members are of unusual interest.

The Polar Bear.

The Polar Bear stands alone in its genus. It is the king of the frozen North, and its robe is pure white, all the year round. It inhabits the coasts of the Arctic Ocean, all around the pole, and wanders over the arctic islands and the great ice-fields almost as far north as man has ever gone. Nansen saw its tracks at Latitude 84°,—its farthest north.

As a rule, the Polar Bear follows the edge of the great ice-pack, for the sake of the seals and walruses which move with it, north in summer, and south in winter. He seldom travels more than a day's journey inland on any shore. His food consists chiefly of seals, walruses, fish and dead whales; at times of vegetable matter.

LIST OF THE BEARS OF NORTH AMERICA.

	Polar Bear,	*Thalarctos maritimus* (Phipps),	Arctic regions generally.
The Big Brown Bears.	**Kobuk Bear,**	*Ursus innuitus* (Merr.),	Kobuk River.
	Kodiak Bear,	*Ursus middendorffi* (Merriam),	Kodiak Island, Alaska.
	Yakutat Bear,	*Ursus dalli* (Merriam),	Yakutat Bay, Alaska.
	Peninsula Bear,	*Ursus dalli gyas* (Merriam),	Pavlof Bay, Alaska.
	Merriam's Bear,	*Ursus merriami* (Allen),	Portage Bay, Alaska.
	Kidder's Bear,	*Ursus kidderi* (Merriam),	Chinitna Bay, Alaska.
	Sitka Bear,	*Ursus sitkensis* (Merriam),	Alaska coast, near Sitka.
The Grizzly Bears.	**Silver-Tip Grizzly,**	*Ursus horribilis* (Ord),	Wyoming to Alaska.
	Sonora Grizzly,	*Ursus horribilis horriaeus* (Baird),	S.-W. New Mexico.
	Alaskan Grizzly,	*Ursus horribilis alascensis* (Merr.)	Norton Sound, Alaska.
	Barren Ground Grizzly,	*Ursus richardsoni* (Swainson),	Great Slave Lake and Barren Grounds.
The Black Bears.	**Black Bear,**	*Ursus americanus* (Pallas),	North America.
	Labrador Bear,	*Ursus americanus sornborgeri* (Bangs),	Labrador.
	Louisiana Bear,	*Ursus luteolus* (Griffith),	Louisiana and Texas.
	Everglade Bear,	*Ursus floridanus* (Merriam),	Florida.
	Glacier Bear,	*Ursus emmonsi* (Dall),	Yakutat Bay, Alaska.
	Charlotte Bear,	*Ursus carlottae* (Osgood),	Queen Charlotte Islands.
	Inland White Bear,	*Ursus kermodensis* (Hornaday),	British Columbia.

In 1874, when Mr. Henry W. Elliott and Lieutenant Maynard visited St. Matthew Island, a lonely bit of treeless land in the northern portion of Bering Sea, they found upon it between 250 and 300 Polar Bears! The animals were basking in the warm sunshine, shedding their winter coats, and growing fat on the roots of the plants and mosses that grew there. On one occasion *twenty bears* were in sight simultaneously. The bears literally overran the island, grazing and

E. R. Sanborn, Photo, N. Y. Zoological Park.

POLAR BEAR.

rooting about like hogs on a common. They showed no disposition to fight, but always ran when approached.

The Polar Bear is a tall animal, with long legs, flat sides, and paws that are very wide and flat. The largest specimen in the New York Zoological Park is 50½ inches in height, 7 feet 2 inches in length, and weighs about 800 pounds. When standing erect on his hind legs, the end of his nose is 8 feet 8 inches from the ground. If properly and comfortably caged, and provided with a swimming pool five feet deep, Polar Bears in the temperate zone do not suffer from the heat of summer, and can endure hot weather fully as well as our black bears. Of course they require shade in summer; but it is not necessary to put ice in their pool to cool the water.

The power of this active, warm-blooded animal to resist cold is one of the wonders of Nature. With the temperature many degrees below zero, the Polar Bear cheerfully leaps into the Arctic Ocean, amid the broken ice, and swims for hours. Of all bears, it is the best swimmer, and it dives with great ease. Thanks to the limitations imposed by the Frost King on hunting in the arctic regions, it is not very probable that the Polar Bear ever will be exterminated by man.

The Big Brown Bears.

In 1896 the specimens collected by the United States Biological Survey, at Washington, revealed to Dr. C. Hart Merriam the presence in Alaska of two or three species and subspecies of huge brown bears, totally different in character from all the American bears previously known. These bears range from Sitka around to the extremity of the Alaskan Peninsula, Kadiak Island, and inland for unknown distances. They are marked by their light brown color, high shoulders, massive heads of great breadth, short, thick claws, and shaggy pelage. In their high shoulders, they resemble the grizzly bear, but otherwise differ from them in many ways.

The most northern species is the big Kobuk Bear, found on the Kobuk River, three hundred miles southwest of Point Barrow, and about the same distance northeast of Nome.

It is sufficient for our purpose to set forth only the species which seems most sharply defined, and which may be considered representative of the whole group.

The Kodiak Bear,[1] of Kodiak Island, and probably also of the Alaskan Peninsula and the mainland for some distance eastward, is not only the largest of all living bears, but also the largest carnivorous animal in the world. Several skins of immense size, and skulls 19 inches in length, have been collected. The largest specimen ever killed and measured by a naturalist was a female killed at Chinitna Bay, by Mr. James H. Kidder, which had a shoulder height of 51 inches.

A very large flat skin measured at Kodiak by Mr. J. A. Loring, was 9½ feet long by 10½ feet wide across the fore legs.

Immediately after shedding, the new coat of the Kodiak Bear is dark-brown, like that of a grizzly, but it soon changes to a beautiful golden-brown tint. In March and April, the old coat is of a golden-yellow color, and really very beautiful. The full coat is long, thick and shaggy, and

[1] *Ur'sus mid'den-dorf-fi.*

except when shedding is in full progress, the animal makes a very imposing appearance. This species is recognized by its uniform brown or golden color, its high shoulders, broad and massive head, flat forehead, short, square nose, and a drop in the upper line of the head in front of the eyes. Mr. Kidder states that the bears on Kodiak Island are uniformly colored over the body and legs, but those on the mainland are darker on the legs than on the body.

The Kodiak Bear catches and devours great numbers of salmon, which are so abundant in many Alaskan streams that it can throw them out with its paws. It also eats quantities of the rank marsh grass which grows along many salmon streams where they flow through alluvial plains before discharging into the sea. It inhabits the most rugged mountains, and is seldom killed save when it leaves the shelter of the timber and comes into the open river valleys and bay heads to feast on freshly-caught salmon, with tender grass for dessert.

During the past ten years so many residents of Alaska have been either maimed or killed by big Brown Bears that it has become necessary in a few places to reduce the number of bears. The bears of this group show great boldness in attacking hunters who have fired at them without deadly effect, biting their flesh from head to foot, and then leaving them alive! On some occasions non-aggressive men have been attacked; but usually when these animals are encountered, unless fired at, they run away. At present they seem to be the boldest of all bears, and the most aggressive.

In captivity they are quiet, steady-nerved, and reliable in the doing of what they are taught to do in the daily routine. During the twenty-seven years that the New York Zoological Park has been exhibiting a large and fine series of Alaska's big Brown Bears, no keeper ever has been bitten or struck by one. These bears are equally pacific toward their cage-mates.

The Grizzly Bears.

The Grizzly Bear.[1]—Of all the bears of the world, this species is certainly one of the most celebrated. During the days of muzzle-loading rifles, its name and fame inspired terror throughout the mountains and foot-hills of the wild western domain which constituted its home. For many years it held the old-fashioned Kentucky rifle of the pioneer in profound contempt, and frequently when it was used to annoy him, the user met a tragic fate. I believe that Grizzlies have killed and maimed a larger number of hunters than all other bears of the world combined.

Down to the advent of the breech-loader, the Grizzly was a bold, aggressive and highly dangerous animal. When attacked, he would charge his enemies with great ferocity, striking terrible blows with paws that were like sledge-hammers armed with huge hooks of steel. The combined swiftness and strength with which any large bear can strike must be seen or felt to be fully appreciated.

I have made many observations on the temper of the Grizzly Bear, and am convinced that naturally the disposition of this reputedly savage creature is rather peaceful and good-natured. At the same time, however, no animal is more prompt to resent an affront or injury, or punish an offender. The Grizzly temper is defensive, not aggressive; and unless the animal is cornered, or *thinks he is cornered*, he always flees from man.

Either in captivity or freedom, the Grizzly responds to fair treatment as well as any well-armed wild animal ever does, and far better than any other species with which I am personally acquainted. In the Yellowstone Park, where for several years past all bears have been fully protected, both the Grizzly and black bears now live in close touch with man, without breaking faith with him. Although they frequently visit the hotels, and steal food from the wagons and camps of tourists, I believe *no bear has yet broken faith with the Government* by molesting either his human neighbors or domestic animals! This fact speaks volumes for the moral character of our bears.[1]

The Grizzly is an animal of commanding appearance, and amongst other wild beasts it

[1] *Ur'sus hor-ri'bi-lis.*

[1] Since the above was written, the truce of the Yellowstone Park has been broken. Two horses belonging to a party of tourists have been killed by bears, and the aggressiveness of the latter has become so serious that it will be necessary for the government to take measures which will teach them to keep their place.

acknowledges no superior. A small Grizzly cub which we once set free in a mixed company of five or six bears of other species, all of which were larger than he, boldly stalked into the centre of the group, with an air of conscious superiority and courage that was both characteristic and amusing. It was the other bears who were frightened, not he!

Specimens of this species are readily recognized by their high shoulders, powerful proportions, grizzly-gray hair, and long curved claws. The standard color (in winter) is brown next to the skin, the extremities of the hair being tipped with silvery gray, from which has come the common name of "Silver-Tip."

From Mexico and southern California to the Yukon valley, especially along the main ranges of the Rocky Mountains, the Grizzly shows about six different shades of color, from brown to silvery gray. The huge brown Grizzly of southern California, now very rare, has been described as a species distinct from the Rocky Mountain Silver-Tip. I once measured the dry skin of one of these animals, which was 9 feet 4 inches in length, and 10 feet 3 inches wide across the shoulders, between the ends of the front claws.

So far as I am aware, the largest Grizzly Bear ever actually weighed was one that lived and died in the Lincoln Park menagerie, Chicago, and was weighed by Mr. G. O. Shields. Its weight was 1,153 pounds; yet when alive, western hunters who saw it frankly admitted that it was larger than bears killed by them which they "estimated" at 1,800 pounds! Thus far the Rocky Mountains have not produced a wild Grizzly actually weighing over 800 pounds, and the average weight of the adult Grizzlies killed

A GRIZZLY BEAR AT HOME.

Photographed in the mountains of western Wyoming, by F. C. Wolcott. The bear was enticed by a bait to within thirty feet of the camera, and taken by flashlight.

in the United States during the last fifteen years has been between 500 and 600 pounds.

In all parts of the United States save the Yellowstone Park and the Clearwater Mountains of Idaho, the Grizzly is now a rare animal, and so difficult to find that it is almost useless to seek it this side of British Columbia. Like other large mammals of this continent, the long-range, high-power rifles leave them absolutely no chance for their lives, and in a short time none will exist in the United States outside of the Yellowstone Park and the zoological gardens. In the wilds of Alaska, they may survive for perhaps a quarter of a century longer. Unfortunately, the Grizzly loves to roam over treeless mountains, on which his huge bulk makes him conspicuous for miles, and invites the attacks of his enemies. He loves water, swims well, and is a great traveller, but is quite unable to climb trees. Like all other bears, he eats nearly everything he can chew, and is very partial to berries, and fruit of all kinds.

The Black Bears.

The Black Bear[1] is the best known bear in North America. It is found in nearly all the mountains and great tracts of forest between Florida and Alaska, and from Nova Scotia to the Pacific coast. During the past forty years it has been seen or killed in forty states of the United States, in Mexico, Alaska, and eleven of the British provinces. Its farthest south is the mountains of Costa Rica.

Photo. by E. R. Sanborn, N. Y. Zoological Park.

AMERICAN BLACK BEAR

From northern Wisconsin.

Its standard color is jet black, all over, except the nose, which is dirty white or light brown. A

[1] *Ur'sus a-mer-i-can'us.*

very confusing fact about the Black Bear is the frequency with which it runs into brown or cinnamon colors. Sometimes black and brown cubs have been found in the same litter. Very curiously, however, this color is found only in the Rocky Mountains, and farther west. In its brown phase, this animal is called the **Cinnamon Bear,** and in the Rocky Mountain regions and Alaska, brown specimens are almost as numerous as black. Sometimes it is difficult to believe that both kinds belong to the same species, but this seems to be a fact.

GLACIER BEAR.

Drawn from a specimen in the United States National Museum.

Some grizzlies are very dark brown, but they are never inky black, like the true Black Bear. The latter differs in form from the grizzly in being highest in the middle of the back, very round on the hind quarters, low at the shoulders, and also by the fact that in walking it usually carries its head low. It is a smaller animal, and its claws are short and well adapted to tree-climbing. It conceals itself from its enemies much more successfully than the grizzly, and therefore still survives in such places as the forests of the Adirondacks, the Catskills, in West Virginia, and the swamps of the southern states.

When properly treated, small Black Bears are good-tempered and playful in captivity; and some are easily tamed, and taught to perform tricks. Cubs are very interesting when small, but by the time they are a year old, they become so strong and troublesome, as well as dangerous, that private owners nearly always are heartily

glad to get rid of them. Never buy a Black Bear cub in the belief that it can be kept for amusement and resold at a profit; but if thine enemy offend thee, present him with a Black Bear cub.

The Black Bear is a timid animal, and always runs when observed by man. It is a good climber, runs quite swiftly when pursued, but in a rough and tumble fight it bawls, roars, and coughs.

The Glacier Bear,[1] found on the glaciers around Yakutat Bay, near Mt. St. Elias, Alaska, is one of the recent discoveries in the Northwest, but it is so clearly distinct as to merit special notice. Thus far no living specimens have found their way into zoological parks or gardens, and the only mounted skin on exhibition is in the United States National Museum. It is exactly reproduced in the accompanying illustration.

The species is known to-day only by the single specimen referred to, and a few flat skins. As mounted it is only 24 inches in height at the shoulders, and is beyond question the smallest species of bear in America. Its color is a peculiar bluish gray, on all parts save the muzzle from the eyes forward, which is dark brown or black. The hair is long, very thick, woolly in texture, and stands out straight all over the body. The rarity of this animal in collections, and the long delay in its discovery, are due to the rough, inhospitable, and dangerous character of the country in which it lives.

The Inland White Bear.—The most interesting discovery in bears of the past twenty-three years is the Inland White Bear of northern British Columbia, described by the author from specimens brought to light through the efforts of Mr. Francis Kermode, curator of the Provincial Museum at Victoria, British Columbia. The species was named Ursus kermodei.

This is a small bear, of a clear, creamy-white color, structurally belonging in the group of black bears. The type specimens came from Gribble Island. At first the type specimens were by some observers believed to be albino black bears, but the twenty-five or more specimens that have been taken since 1905 thoroughly dispose of that idea. The Inland White Bear has come to stay. Five mounted specimens are shown in a group in the Victoria Museum, and another is to be seen in the Carnegie Museum at Pittsburgh. Up to 1914 no specimens had been taken alive.

[1] *Ur'sus em'mons-i.*

THE RACCOON FAMILY.

Procyonidae.

The Raccoon,[2] placed next to the bears, is also plantigrade in its manner of walking. It

THE RACCOON.

is a cheerfully persistent animal, and no amount of hunting discourages it, or drives it away from its favorite haunts. It is at home in the timbered regions of the southern and eastern United States, especially where there are swamps,—for the Raccoon loves to play in water. In the West it ranges from Arizona to British Columbia.

Its favorite dwelling-place is a hollow tree, and its yearly family consists of five or six young. In its appetite, it is as omnivorous as any bear, and eats everything that it can chew,—from live rabbits down to green corn,—fish, flesh, or fowl. The only point on which the Raccoon is particular, regarding its food, is in soaking it in water before eating it.

Excepting the cacomistle or "civet cat" of the Southwest, this is the only animal in the United States which has black and gray rings around its tail. A live "'Coon" makes one of the

[2] *Pro'cy-on lo'tor* and related species.

most satisfactory carnivorous pets that a boy can keep in confinement.

The Cacomistle, "Civet Cat," or Bassarisk[1] is a strange little creature like a small pine marten with a long, bushy tail, and many common names. It is spread over so wide an area of our country that its personality should be better known. It inhabits Mexico and the southwestern United States from Texas to California and north to southern Oregon. These are the names by which it is called and miscalled: in Mexico, *Cacomiz'tli,* or in English *Ca-co-mis'tle;* in Texas, *Texas Civet Cat,* and *Cat Squirrel;* in California, *Mountain Cat* and *Ring-Tailed Cat;* in Arkansas, *Raccoon Fox;* by various scientific authors from Audubon to Allen, *Civet Cat, Ring-Tailed Bassaris,* and *Northern Civet Cat.*

Now, as to the facts regarding this pretty little creature, it is not a "cat" of any kind, and there is about it not a trace of "civet."

[1] *Bas-sa-ris'cus as-tu'tus* and related species.

Dr. Coues proposed Bassarisk as a name that was appropriate, and entitled to use. Let it be so called henceforth, and the misnomers relegated to obscurity, where they belong. Its original Mexican name is so ill adapted to our wants it never will be generally used.

The Bassarisk is, after the true raccoon, the only animal in the United States possessed of a long, bushy tail with alternating black and white rings around it. It climbs trees, and nests in hollow branches like a squirrel; it scratches and bites, and catches rats, mice, and small birds like a cat; and it has a many-sided appetite, like a raccoon. Its length of head and body is 16 inches, tail about the same, and its general color is a brownish gray. It is a night prowler, and often makes its home in outbuildings and deserted ranch houses. In California it is occasionally kept in captivity by the miners, and is said to make a very attractive and interesting pet.

INLAND WHITE BEAR GROUP IN VICTORIA, B. C., MUSEUM.

CHAPTER IV

THE ORDER OF SEALS AND SEA-LIONS

PINNIPEDIA

Some students may feel that it is useless for land dwellers to try to become acquainted, at long range, with sea animals. Toward many sea animals, this feeling is justified; but it should not be entertained toward the bold and hardy fin-footed children of the surf. The seals and sea-lions of our shores are well worth knowing.

From the warm and luxurious shore of southern California to Oregon's storm-beaten Tillamook Rock, and on up to the inhospitable, rock-bound edge of western Alaska, you will find at intervals, where Nature has done some of her grandest work in shore-building, colonies of bold and hardy sea-lions. On the Pribilof Islands lives the most valuable of all the fur-bearing animals of the world, the fur-"seal," which has contributed millions of dollars to our national treasury, and more than repaid the whole price of Alaska.

On the low shores and adjacent ice floes of the North Atlantic live the seal herds that annually yield an immense store of valuable oil, and furnish employment for thousands of Newfoundland sailors and sealers.

The reader may rest assured that even though his home be in the centre of the Great Plains, the North American seals and sea-lions are well worth knowing; for, sooner or later, travel surely will bring him into visual contact with many of them, either in museums, zoological gardens, or alive in their haunts. Let us, then, lay the foundation for a profitable acquaintance with them.

By some writers, these animals are classed with the Ferae, because they eat flesh; but to associate in the same Order such widely different creatures as sea-lions and cats seems incongruous, if not incorrect.

The Order Pinnipedia[1] contains three groups of sea-faring animals, distributed widely through the ocean waters of the world, and in some instances, in fresh water, also. They are the Sea-Lions, Seals and Walruses.

A **Sea-Lion** has a long, supple neck, and long, triangular front flippers that have neither hair nor claws, but are simply living paddles. Their hind limbs are web-toed flippers. They have very small, sharp-pointed ears, carry their heads high, and all are lively, active animals, both in swimming and in climbing rocks. The males of some species grow to enormous size, and have faces so lion-like in appearance that this resemblance has given the group its popular name, —Sea-Lion.

A **Seal** is a short-necked, fat-bodied, low-lying, clumsy animal, not nearly so active on land nor so intelligent as a Sea-Lion. Its front flippers are short, square-ended, fully covered with hair, and provided with claws. They have no external ears of skin and cartilage. Their hair is short, close, and stiff, and of no value as fur save to the Eskimo, to whom every Seal is a Godsend, and utilized in a great variety of ways.

A **Walrus** is a sea mammal of great size, formed somewhat like a Sea-Lion, and it is the clumsiest living creature that ever comes upon land. It has two long ivory tusks that grow downward from the upper jaw, a very thick skin which lies in deep folds, no hair worth mentioning, and a very dull brain.

The following are the groups and species which every American should know :

[1] *Pin-ni-pe'di-a* means "fin-footed."

PACIFIC WALRUS,

STELLER'S SEA-LION,

HARBOR SEAL.

On the same scale.

	FAMILIES.		EXAMPLES DESCRIBED.[1]	
ORDER PINNIPEDIA.	Sea-Lions	*O-TA-RI'I-DAE*,	**California Sea-Lion,**	*Zalophus californianus.*
			Steller's Sea-Lion,	*Eumetopias stelleri.*
			Fur "Seal,"	*Callotaria ursina.*
	Seals	*PHO'CI-DAE*,	**Ringed Seal,**	*Phoca foetida.*
			Harbor Seal,	*Phoca vitulina.*
			Harp Seal,	*Phoca groenlandica.*
			Hooded Seal,	*Cystophora cristata.*
			Ribbon Seal,	*Histriophoca fasciata.*
	Walruses	*OD-O-BEN'I-DAE*,	**Pacific Walrus,**	*Odobenus obesus.*
			Atlantic Walrus,	*Odobenus rosmarus.*

THE SEA-LION FAMILY.

The California Sea-Lion,[2] or **Barking Sea-Lion,** is the most familiar representative of the first group, for the reason that this species is easiest to catch alive, and keep in captivity. In zoological gardens and travelling shows, this is the animal which cries out so frequently, and with ear-piercing clearness and volume, "How-woo! *Hook! Hoook! Hook!*" It inhabits nearly the entire coast of California, the Farallone Islands, the famous Cliff House rocks, and the Lower California peninsula. Full-grown males are about 7 feet in length, weigh about 450 pounds, and all are of a uniform dark-brown color. An adult female which died in the Zoological Park weighed 112 pounds and measured: length of head and body, 56½ inches, tail, 2¾ inches, total length from nose to end of hind flippers, 70¼ inches, girth, 31½ inches. These creatures are very active in the water, and can climb rocks,

KELLER, Photo., N. Y. Zoological Park.

CALIFORNIA SEA-LION.

and even high cliffs, with surprising agility. When frightened, Captain Scammon says they will leap from a height of sixty feet into the sea.

The hair of this animal is very short, coarse, and of no value. The California Sea-Lions rarely eat fish, but live chiefly upon squids, shell-fish

[1] The most important of these species will be found well described and commented upon in Mr. Henry W. Elliott's interesting volume entitled "Our Arctic Province." (Charles Scribner's Sons.)

[2] *Zal'o-phus cal-i-for-ni-an'us.*

and crabs. For reasons known only to themselves, they swallow many round pebbles, from one to two inches in diameter. We once took 16 pounds (half a pailful) from the stomach of a medium-sized specimen.

In captivity all kinds of seals and Sea-Lions live contentedly in fresh water. The value of a living California Sea-Lion in New York City is about $150. This species possesses great intelligence, and quite recently several specimens have been trained to go through a show performance which is really wonderful, including a most remarkable act in which a Sea-Lion successfully balances a large ball on the point of its nose.

An important incident in the life history of the California Sea-Lion furnishes a good illustration of the folly of condemning a wild species to destruction on insufficient evidence.

For several years the fishermen of San Francisco complained that the Sea-Lions of the California coast devoured such enormous quantities of salmon and other fish that they were seriously affecting the available supply; besides which, they caused great damage to nets and impounded fish. They demanded that the Sea-Lions be destroyed, and finally convinced the state authorities that their contentions were well founded.

It was decided that the animals should be destroyed, by systematic shooting, down to a comparatively small number; and the slaughter was duly ordered. Men were engaged to do the work, in a business-like way, and an official request for permission to kill on the light-house reservations of the government was granted.

But there were certain naturalists who doubted the entire accuracy of the charges made against the Sea-Lions, and asked for proof in detail. When no evidence of a specific and convincing nature was brought forward, they requested that the slaughter proposed on the Farallone Islands, and other light-house reservations, be deferred, pending a careful inquiry; and this was done.

However, where the state authorities had full power to act, the killing proceeded in a few localities. It happened that during the killing of California Sea-Lions on the shore of Monterey Bay, and vicinity, Professor L. L. Dyche, of the University of Kansas, arrived on the scene to pursue studies in marine life. He examined the stomachs of twenty Sea-Lions which were washed ashore, and of five more which he killed for the purpose of mounting their skins.

Every stomach examined contained the remains of squids and devil-fish (Octopus), one or both; and both of which are among the fisherman's enemies! Not one of the twenty-five stomachs which he carefully examined and reported upon contained any portion of a scaled fish.

In 1901, the United States Fish Commission conducted a systematic investigation of the food habits of the Sea-Lions of the Pacific coast and the report of Messrs. Rutter, Snodgrass and Starks appears in the Report of the Fish Commissioner for 1902. At six points on the coast of California, the investigators killed a total of twenty-four specimens of the California Sea-Lion, and eighteen of the Steller Sea-Lions. The report says:

"Of thirteen California Sea-Lions whose stomachs contained food, five had eaten fish and eleven had eaten squid. The quantity of fish was inconsiderable, seventeen small fishes being the maximum, while the remains of one hundred to three hundred squid were found in each of five stomachs.

"All the thirteen Steller Sea-Lions whose stomachs contained food had eaten fish, and five had eaten squid, or octopus. The number of squid eaten was small, six being the maximum number in one Sea-Lion, while the quantity of fish was large, at least thirty-five pounds being taken from one stomach."

The detailed report of the kinds of fishes consumed as food by these animals reveals an assortment of very little value, and not one salmon or shad. Professor Dyche's discovery—that the California Sea-Lion feeds almost exclusively upon squid—was fully confirmed, for the twenty-four animals killed contained only three rock-fish, two hake, twenty-four "small fish" and one chimera,—but over eleven hundred squid! The stomachs of the Steller's Sea-Lions contained fourteen rock-fish, two perch, thirty clupeoid fish, seventeen "large fishes of 12 to 18 inches," and a few skates, sharks and squids.

"The testimony of the fishermen was so contradictory it is of no value. . . . One man claims that the Sea-Lions are becoming more numerous and destructive every year, while another claims that they are rapidly becoming

exterminated." There was "practically no complaint" of fish destruction "at the time of the investigation. Sea-Lions were scarcely ever seen in the vicinity of the salmon nets during 1901."

At the mouth of the Columbia River, "the fishermen were unanimous in their denunciation of the Sea-Lions." "The shallow water and the large number of salmon make that point a favorite feeding ground, and there is no doubt that the Sea-Lions are doing much damage there." "It appears that the Sea-Lions are doing very little damage anywhere excepting at the mouth of the Columbia River." (Report, page 117.)

A summary of the results of the investigation establishes three facts:

1. The California Sea-Lion is not guilty of destroying fish to any great extent, and deserves protection, not death.

2. Steller's Sea-Lion eats miscellaneous fish; but on the coast of California does nothing to merit destruction. At the mouth of the Columbia it is destructive, and there deserves to be kept in check.

3. Wild animals never should be destroyed on the strength of general opinions; for a supposed enemy may, on careful investigation, prove to be a friend.

Steller's Sea-Lion,[1] the largest Sea-Lion in the world, inhabits a few isolated spots on the Pacific coast, from Santa Cruz, California to Bering Strait. Large male specimens attain an average length of 10 to 11 feet, stand 6 feet high, and attain a weight estimated by competent observers at 1,400 pounds. The full-grown male has a girth of 8 to 9 feet, a lion-like head, coarse neck hair 4 inches long, and canine teeth like a grizzly bear, which are much used in fighting.

STELLER'S SEA-LION.

The full-grown females are from 8 to 9 feet long, weigh from 400 to 500 pounds and are more finely formed. The hair is coarse, and the animal is now of practically no commercial value, save for its oil. This species is readily distinguished from the California sea-lion by its far greater size, its hoarse voice, the very large neck, and the long, coarse neck hair of the males.

In its habits, this great Sea Lion is very peculiar. Amongst themselves the old males

[1] *Eu-me-to'pi-as stel'ler-i.*

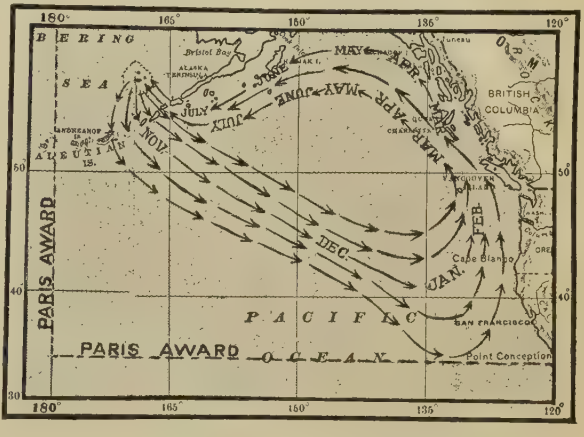
fight fiercely, and with their big canine teeth inflict upon each other many severe skin wounds. I have seen specimens whose necks bore many large scars. In the presence of man, however, they are timid, and easily frightened.

This large Sea-Lion is found on the coast of California, in small numbers only, at Point Ano Neuvo, near Santa Cruz, at Purissima, the Farallone Islands, Point Reyes, and Point Arena. On the coast of Oregon it is found about the mouth of the Columbia and Tillamook Head. The agents of the United States Fish Commission, reporting observations made in 1901, stated that "probably half of the Sea-Lions of California (of both species) are found at the Farallone Islands, and it seems doubtful whether the total number on the coast amounts to five thousand." A large colony of Steller's Sea-Lions inhabits Bogoslof Island, Alaska, living almost in the shadow of that celebrated volcano.

The Fur Seal, which yields the beautiful and costly fur so highly prized for ladies' garments, is not a true Seal, but a Sea-Bear or Sea-Lion, quite similar in form, size, and general habits to the California species already described. It is found on the Pribilof or Seal Islands, in Behring Sea, where during the Russian occupation it was twice nearly exterminated for its fur; on Copper and Robben Islands, off the coast of Siberia; and in the open sea from the Pribilof Islands southeastward to the thirty-fifth parallel, thence northward along the coast, back to the Seal Islands.

The Fur Seal has two kinds of hair. Its outer coat is long, stiff, coarse, and gray in color. In preparing skins for market, all this is plucked out and thrown away, leaving only the fine, soft, brown under fur, which before manufacture is dyed a rich, blackish-brown color. Fur Seal garments vary in price from $200 to $700.

The Fur Seal has strange and interesting habits. It spends about two-thirds of each year far at sea, making a circuit of 6,000 miles in the open ocean without touching land. For some strange reason, the herd in American waters has chosen the two Pribilof Islands, St. Paul and St. George, as the only spots in our waters whereon they are willing to land and rear their young. To these favorite breeding-places, on these islands known as "hauling-grounds," the Fur Seal millions were wont to repair in the early summer of each year, to rear their young. The returning herd begins to arrive between May 1 and 15, the breeding season is over by September 15, and by the end of November all the Seals are gone on their great winter cruise southward into warmer waters. By a long series of inquiries the winter cruise of the herd has been mapped out by Henry W. Elliott, as shown below.



ANNUAL WINTER MIGRATION OF THE FUR SEAL HERD.

On the breeding grounds, each large and hard-fighting old male gathers round him a harem of from six to ten females, fights off all rivals, young or old, and elects himself the head of an imposing family. The three-year-old male Seals—called "bachelors"—were killed for their fur, to the number of about 100,000 each year. The females bear only one "pup" annually, immediately after landing in May.

The mother Seals leave their young, go to sea in search of food, remain several days perhaps, or even a fortnight, then return and go straight to their own respective offspring. It was the killing of the mothers at sea from 1886 to 1912 that produced an enormous falling-off in the number available each year.

POLITICAL HISTORY OF THE FUR SEAL.

In all the written history of the wild animals of the world, no one species ever has figured in the politics of nations, nor caused one-half as much contention between great nations, as the Fur Seal. This was because of its great numbers, its high value, its erratic habits, and its wide

dispersal on sea and land. After many years of folly and wrangling, the Fur Seal was saved from total extinction by a triumph of international common sense and square dealing—between the United States, England, Canada, and Japan.

In 1867, when the United States paid Russia $7,000,000 for Alaska, America took over a Fur Seal "industry" that twice had narrowly escaped annihilation at the hands of its former owners. In 1873, as the special agent of the United States Treasury Department, Mr. Henry W. Elliott wrote his masterly monograph of "The Fur Seal," and calculated and estimated the total Seal population then alive on the Pribilof Islands to be 3,193,420. In 1872 the Alaska Commercial Company leased from the United States the right to kill each year 100,000 young male Fur Seals for an annual payment of $317,500. All killing operations were conducted on land, and there was no poaching.

In 1880, "pelagic sealing" began. This means the killing of Seals at sea, by any person who could get at them, without regard to sex, or to losses by Seals shot and never secured. It was the accepted estimate that for every male Seal secured four females were killed. The favorite hunting grounds for the seal poachers were around the Pribilof Islands, where during the breeding season they intercepted the mothers between their young on shore and their feeding-grounds 60 miles away. Uncountable thousands of Fur Seal "pups" perished of starvation.

From a catch by poachers in 1882 of 15,551 Seals, the annual number taken rapidly rose to 61,838 in 1894, when it began to decline. Then England and America became alarmed. In 1893 the Paris Tribunal was held, in which England won all her contentions regarding her Fur Seal rights at sea, and we lost practically all of ours. Because Japan and Russia were not in the Tribunal, they continued Fur Seal hunting at sea, and the Tribunal did our Fur Seals more harm than good.

By 1910 the Fur Seal industry was down to a legal annual catch on our Islands of 15,000 head, and the cost of our attempts to protect our Fur Seals against wasteful slaughter far exceeded the revenue from the industry. Less than 200,000 Alaskan Fur Seals remained alive, and the end of them was in sight. Various efforts had been made at the State Department and in Congress, by sincere friends of the Fur Seal, to develop real remedial measures, but there was always some one ready to thwart all those efforts.

In the summer of 1910 the writer of this volume felt called upon to make the experiment of an independent private-citizen appeal to Congress for three measures that, if carried out, would save a valuable species and a valuable industry. He proposed to the Camp-Fire Club of America the making of a systematic and determined campaign in Congress (1) to stop the killing of Seals by the leasing system; (2) to secure an international treaty with Canada, England, and Japan to stop all seal-killing at sea; and (3) to give the Seal five years of absolute close season for recuperation.

The Club approved the proposal, and through the long and bitter fight that ensued, vigorously supported it. Senator Joseph M. Dixon espoused the cause of the Fur Seal—and at the close of the first "hearing" his Conservation Committee took action that immediately stopped the leasing system of seal-killing.

Secretary Philander C. Knox immediately set the State Department in motion to negotiate a 5-power treaty to stop pelagic sealing, and without delay or accident a very fine and perfect treaty was carried through to a triumphant finish.

Congress gave our Seals a five-year close season, which went into effect in 1912; and from that year to this there has been no more "pelagic sealing."

Through the Act of Congress of 1912, the recuperation and increase of the Fur Seal herds have amply justified the contentions of their defenders. The annual increase in Seal population is shown by the following census returns of the United States Bureau of Fisheries:

1916	417,281	1922	604,962
1918	496,432	1924	697,158
1920	552,718	1926	761,281

All details of herd management are in the hands of the United States Government. In 1926 a total of 22,676 skins were taken.

Southern Sea Elephants.—Far down in the Antarctic Ocean, inhabiting some of the islands surrounding the Antarctic Continent, there yet are living many unkilled pinniped monsters that fairly stagger the imagination. As classification lines now exist, these sea-going giants really are

Drawn by J. Carter Beard.

FUR SEALS ON THEIR "HAULING GROUNDS," PRIBILOF ISLANDS.

The large central figure is that of an old male, surrounded by the members of his "harem." In the foreground are two young "bachelor" seals, such as were regularly killed for their fur.

THE SOUTHERN SEA ELEPHANT, "GOLIATH."

"sea-lions"; but the free proboscis, from six to twelve inches long on the adult animal, long ago suggested "elephant" as a popular name, and we may just as well accept it.

The Southern Sea Elephants[1] (possibly divisible into three or four species) are found on the Kerguelen Islands, South Georgia, Heard's Island and the South Shetlands. From several other islands they have quite disappeared. The adult animals are of enormous size. Total lengths of 16, 18, 20, 22, and even 25 feet have been freely recorded by the explorers and whalers who have measured freshly killed specimens, with correspondingly enormous girth, running from 11 feet upward.

At this time (1927) there may be seen, in Stellingen, near Hamburg, Germany, in the private Zoological Park of the Hagenbeck Brothers, an Elephant Seal named "Goliath," from the South Georgia Islands. It is the most amazing member of this Order that ever lived in a zoo. It reached Stellingen in February, 1926, and on September 14 it weighed 4,430 pounds! Its length then was 16 feet, its girth was 10 feet, and sometimes it consumed as much as 350 pounds of fish per day. Of this, and a young female companion, Mr. Lorenz Hagenbeck said: "These are the most interesting creatures we ever had." Goliath's spinal column is so supple that it could hardly be more so if made of India rubber. He erects the forward half of his body at a sharp right angle with the prostrate half, and he joyously bends directly backward until his nose touches his rear flippers.

THE HARP SEAL.

On the west coast of Mexico and California there once was found abundantly the **Northern Elephant Seal,**[2] of which a small last-remnant herd still lives on the Mexican Island of Guadalupe. Among sea-lions, it also is a giant. The six adult specimens collected in Guadalupe in the winter of 1911 by a scientific expedition headed by Dr. C. H. Townsend averaged 16 feet in length, with a girth of 11 feet. The proboscis was quite 6 inches long. The Mexican Government has declared that "all persons molesting

[1] *Mac-ro-rhi'nus le-o-ni'nus.*

[2] *M. an-gus-ti-ros'tris.*

that herd of Elephant Seals will be treated as pirates."

THE SEAL FAMILY.

Phocidae.

The Little Ringed Seal[1] is the Seal of the Farthest North, and the friend of the northern Eskimo all round the pole. It is the smallest North American species, and looks very much like the common harbor seal. It goes as far north as it can find breathing-holes. Nansen found it on May 31, at 82° 21′, or within 460 miles of the pole, living in the narrow lanes of water that were then forming in the great polar ice pack. It was a **Bearded Seal,**[2] however, which, on June 22, afforded the brave explorers a good supply of food when men and dogs were almost starved. And, true to its nature, an old polar bear, with two small cubs, was closely following up the seals as they worked north through the ice pack.

[1] *Pho'ca foe'ti-da.* [2] *Er-i-gnath'us bar-ba'tus.*

The Common Harbor Seal,[1] of both our ocean coasts, is a good representative of the Seal Family, chiefly because it is the species most frequently seen. It ascends rivers far above tidal influence, and has been taken in Lake Champlain. In the Columbia River a closely related species has been taken above The Dalles, 200 miles from the sea.

THE RIBBON SEAL.

The Harp Seal[2] is not only one of the handsomest of all Seals, but it is also the species most valuable to man. It is found on both sides of North America, but always in cold waters. In the year 1900, five sealing steamers of Newfoundland took nearly 100,000 seals, mostly Harps, on the coast of Labrador and northward

[1] *Pho'ca vit-u-li'na.* [2] *Pho'ca green-land'ic-a.*

thereof, and the value of the catch was over a quarter of a million dollars.

This species passes through several strongly marked changes of pelage and color. The baby is covered from nose to flipper-tips with a thick coat of long, woolly hair of snowy whiteness. This, when shed at six months after birth, is replaced by a coat of bluish gray hair, with light trimmings. On reaching adult age, in its fifth year, this animal is very strikingly marked by black or dark-brown patches grouped together on the sides and back, on a white or yellowish ground-color apparently in the shape of a harp. This Seal is also called the **Saddle-Back,** and **Greenland Seal.**

The Hooded Seal[1] of the North Atlantic is a large species, often attaining 8 feet in length. The old males are distinguished by the possession of a flexible bag of skin on top of the nose, which is capable of being inflated with air until it forms a lofty and remarkable excrescence on the creature's face. This sac is sometimes 10 inches long and 6 inches high. The color of this Seal is dark bluish-gray, marked with irregular light spots. It once came as far south as New Jersey.

The Ribbon Seal, or **Harlequin Seal,**[2] in its color pattern is the most remarkable of all living Pinnipeds, and there are many persons who consider it the most beautiful member of its Order. On a smooth ground-color, either of blackish-brown or yellowish-gray, Nature has sportively arranged several yards of broad, yellowish-white ribbon. One strip goes around the neck, and ties under the throat. From a point low down on the breast, another starts upward, curves gracefully over the shoulder, drops down in front of the pelvis, where it comes together, then turns and crosses over the body. In many specimens the uniformity of the width of the ribbon is remarkably well maintained.

This Seal is from 4 to 6 feet in length. Its home is on the eastern shore of Bering Sea, and in the fresh waters of Lake Iliamna, in the upper end of the Alaskan Peninsula.

THE WALRUS FAMILY.

Odobenidae.

Of all living monsters that ever move upon land, the **Pacific Walrus**[3] is one of the most wonderful. A full-grown male is a living mountain of heaving flesh, wrinkled, furrowed and seamed, ugly as a satyr, and as strange in habits as in appearance.

Its form is that of a sea-lion with a neck enormously thickened. Its upper jaw is provided with two long, strong tusks of ivory, and its skin is almost destitute of hair. A full-grown male measures from 10 to 12 feet in length from nose to tail, the top of its head is about 5 feet from

HEAD OF HOODED SEAL.

the ground, the girth of its neck is from 12 to 14 feet, and it weighs from 1,800 to 2,000 pounds. Its skin varies from half an inch to two inches in thickness; it is of a dirty yellow color, and lies on a mass of fat which often is six inches thick. The largest pair of tusks known to the author measure 24½ inches in exposed length, and are in the British Museum.

The Pacific Walrus eats more or less of aquatic-plant food, but its principal food is shell-fish and crustaceans. These it digs up from the muddy bottoms of the broad, shallow bays along the coast, crushes between its powerful jaws, and swallows in great quantities, shells and all! Crabs and shrimps form a pleasing variety, and for salad it devours the bulbous roots and tender stalks of marine plants which in summer grow in its home waters.

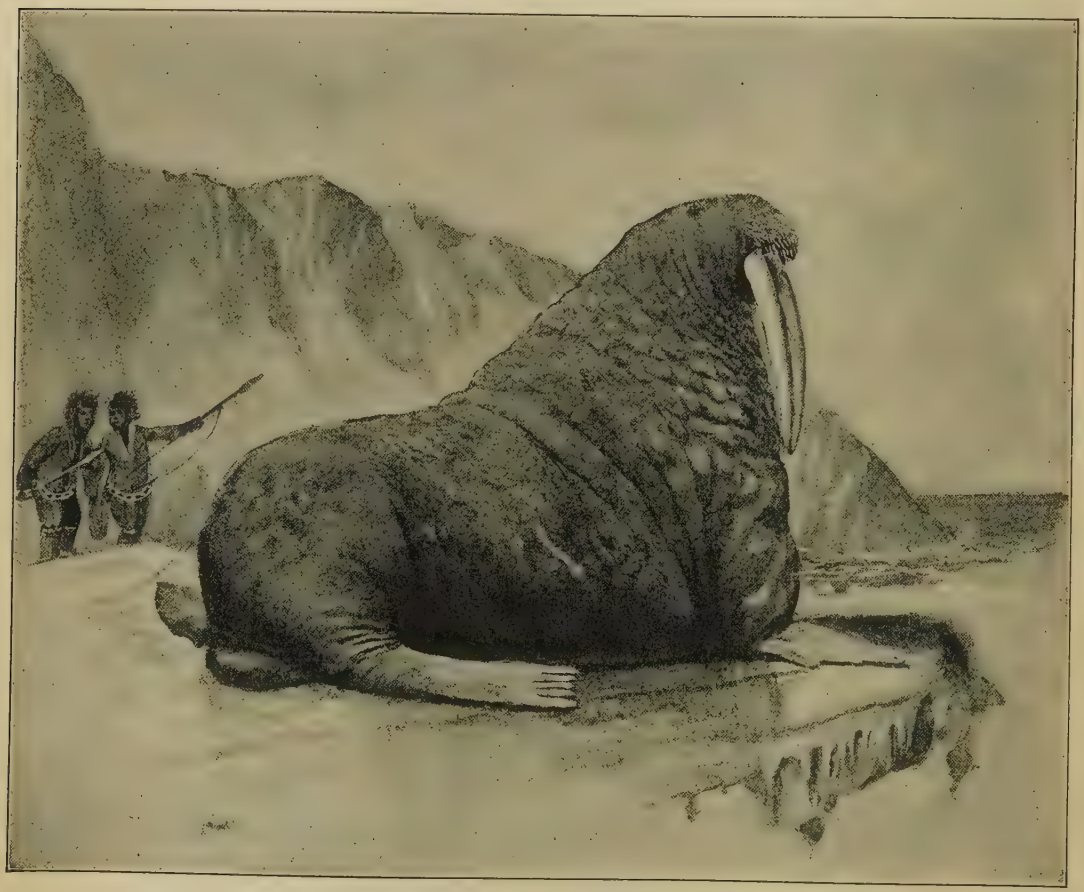
In former times, the Pacific Walrus existed in great herds on the coast of Alaska, from the north shore of the Alaskan Peninsula northward through Bering Strait, and thence eastward as far as Point Barrow. There the herds encountered the edge of the great permanent ice-pack, and could go no farther. In winter the Walrus

[1] *Cys-toph'o-ra cris-ta'ta.*
[2] *His-tri-o-pho'ca fas-ci-a'tu.* [3] *O-do-ben'us o-be'sus.*

herds float about on the ice-fields, retreating southward as the edge of the ice advances. In the open sea, the sleeping posture of the Walrus is floating bolt upright in the water. He grunts and bellows, and many times vessels have been warned off dangerous, fog-hidden rocks by the Walrus lying upon them.

On land the Walrus is the most clumsy and helpless of all land animals, and is easily approached and killed. In the water, it becomes a danger to be avoided, on account of its proneness to wreck small boats. A full-grown Walrus has never been seen in captivity. Two or three very young specimens have reached Europe, and in September, 1902, Commander Robert E. Peary brought one to New York for the Zoological Park, where it was exhibited until it died.

In 1900, steamers bearing gold-miners to Cape Nome passed through herds of Walrus in Bering Sea, and many of the animals were killed, wastefully and wantonly, by passengers firing from the decks, with no possibility of securing a single victim. As elsewhere, the instinct of man in the far north is to slay and slay, and preserve no living thing.



THE PACIFIC WALRUS.

An old male of the largest size. Drawn from a mounted specimen in the United States National Museum.

The Walrus has been hunted so diligently for its oil that to-day very few remain, and the natives who once depended solely upon this animal for food, fuel, lights, boats, dog harness, and leather for all purposes now are on the verge of starvation, and are really kept alive by public bounty. Previous to our purchase of Alaska, about 10,000 Walrus were killed annually by the Eskimo, and utilized. In the long, hard winter

of 1879–80, when the sea was frozen all around St. Lawrence Island, for many miles in every direction, the Walrus herds were forced to remain so far away that all the inhabitants of the Island, save one small settlement, died of starvation.

YOUNG ATLANTIC WALRUS.
Captured by Commander R. E. PEARY, and exhibited in the New York Zoological Park.

The Atlantic Walrus[1] is of about the same length as the Pacific species, but it has a shorter and much smaller neck. Its tusks, also, are much smaller. It is still found in considerable numbers in Smith's Sound, and is quite abundant north of Franz Joseph Land, where Nansen photographed and killed many. Its most northerly latitude is 82°. A specimen killed by Commander Robert E. Peary was 9 feet in length, and weighed 1,569 pounds. The skin alone weighed 220 pounds.

Professor L. L. Dyche has kindly furnished the measurements of the largest male Walrus out of eighteen taken by him on the coast of northern Greenland:

Length (straight line), end of nose to end of body, 129 inches.

Tail, exposed, none.

Length of rear flippers, 26 inches.

Girth of animal when suspended by the neck, 129 inches.

Exposed length of tusk, 19 inches.

Circumference of tusk at base, 8¼ inches.

The largest cow Walrus measured 116 inches in length, 113 in girth, exposed tusk, 10¾ inches.

[1] *O-do-ben'us ros-ma'rus.*

From a photograph by DOBBS, of Nome.

HERD OF PACIFIC WALRUSES IN BERING SEA.

CHAPTER V

THE ORDER OF MOLES AND SHREWS

INSECTIVORA

In the dark and cold embrace of Mother Earth, away from the cheering sunlight, and the beautiful upper world that we enjoy, there dwells a group of mammals so strange, and yet so useful to man, that they excite our admiration for the wise purpose which developed and placed them there. Pass not unthinkingly the moles and shrews, for they have been most cunningly designed to serve a definite and important purpose in the economy of Nature.

In farming countries, the top soil of the earth is a vast incubator for the development of destructive insect larvae. In soil that is rich and productive, "grub-worms," "cut-worms," and "wire-worms" abound; and in regular rotation they greedily devour the seeds, roots and leaves of growing crops. But for the enemies which keep them in check, there would be a hungry grub for every sprouting seed.

And how can man wage war successfully against insect life in the soil? Impossible. To meet this difficult proposition, we need a vigorous living creature with a nose like a gimlet, sharp-pointed teeth, soft fur, feet specially designed for digging, and eyes so small that to them sunlight is an unnecessary luxury. Such animals are found in the moles and shrews, of the Order In-sec-tiv'o-ra, humble but faithful workers in man's interest. Neither the horse nor the ox is more diligent in our service than are these toilers of the soil. Yet what is their reward?

In his mole-like blindness, man frequently discovers things that are not true. Often a perfectly honest farmer concludes that a mole is eating his seed corn in the ground, or the vegetables in the garden; and straightway the mole is killed. His accuser has found a runway following up a row of newly-planted corn, and when the seed fails to sprout, the mole is accused of having eaten it!

In all such cases, the mole is a victim of circumstantial evidence, and suffers through the lack of counsel to cross-examine the witnesses for the prosecution. Did anyone ever find much vegetable food in a mole's stomach? Not often. Did anyone ever see a mole eat vegetable food? Probably not. A mole placed in a box and supplied with vegetable food alone soon starves to death. Moles do not eat seed corn, or garden vegetables; but they do visit corn-hills to eat the grubs that come to devour the corn.

Every young naturalist must learn early what constitutes *direct evidence*. Far too long have the mole and shrew been convicted and slain on circumstantial evidence. Meadow mice sometimes attack seed corn by utilizing the runways that have been made by moles in reaching the corn-hills to secure the grubs that attack the seeds; and almost invariably the testimony is that the moles have done the damage. In France the value of the mole is recognized by law, and the killing of one is punishable by a fine of five francs.

The shrews and moles not only find their food underground, but live the entire cycle of their lives in subterranean darkness. Moles seek their food by digging tunnels in ground that is loose and dry, the roof being raised into a ridge which in smooth lawns is an annoying disfigurement. Gardeners are apt to forget that they always work where insect larvae are thickest, and the need for their help is most urgent. The tunnel-makers are driven from lawns by persistently trampling down their runways.

The Order Insectivora is represented in the United States by two Families, the members of which are easily recognized by the following well-marked characters:

The Moles have pointed heads; *extremely large spade-like front feet*, that always are held with the outer edge up; no neck; the front legs are exceedingly short; there is no external ear, and no external eye; the body is short, thick and clumsy, and the tail is hairless.

The Shrews have pointed heads, but *small*,

1. COMMON MOLE. 2. STAR-NOSED MOLE.

rat-like feet; there is a very small eye, an external ear, and a distinct neck. The body is rather slender, and as a whole, the animal looks much like a short-tailed mouse.

THE MOLE FAMILY.

Talpidae.

This Family contains twelve full species, all quite interesting. Their skins and skulls have been studied closely, but our information regarding their habits is very meagre. As a rule, moles are larger than shrews. The largest of all is an Oregon species, which measures 7 inches in length of head and body, and tail 1½ inches,—an unusual size for a mole.

On all moles the fur is fine, thick, very soft and velvety, and faultlessly smooth and clean. All these creatures love sandy soil, which they can easily burrow.

The Common Mole[1] is known to the majority of country dwellers by its upheaved tunnels on the surface of the ground. In appearance the animal is a flattened, oblong ball of fine, soft, shimmering gray fur, 6¼ inches long, to which the naked, little pink-white tail—which looks like a small angle-worm—adds 1¾ inches. Its nose projects half an inch beyond its mouth, and on the end it feels as hard as if it contained a bone. It terminates in a broad, flattened point, shaped quite like a rock-drill.

The fore foot is three-quarters of an inch wide, but less than an inch in length, including the claws, which measure half an inch. In your hand, a Mole is a wriggling, restless creature. Place it upon ground that is not packed hard, and in about one second it has found a suitable spot for an opening. Its nose sinks into the earth as if it were a brad-awl, with a combined pushing and boring motion, and in three seconds your Mole's head is no longer in sight.

Up comes the powerful right foot, sliding close along the side of his head, edgewise and palm outward, to the end of the nose. The living chisel cuts the earth vertically, and then, with a quick motion it pries the earth sidewise from its nose. Instantly the left foot does the same thing on the other side, while the brad-awl nose goes right on boring. In ten seconds, by the watch, the Mole's body has entirely disappeared, and in three minutes our Mole will tunnel a foot, unless interrupted.

When skinned for dissection, it is found that the eye is merely a small, dark speck under the skin, suitable only to distinguish light from darkness. The eye-ball is about the size of a pin-head. The arm and forearm is a big, hard bundle of tough muscles and powerful tendons, shaped like an Indian club, of enormous size in proportion to the creature's body.

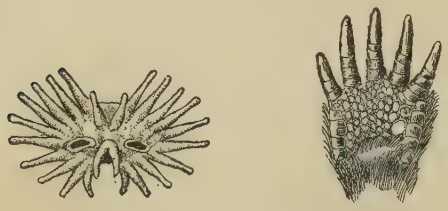
DIGGING MUSCLES OF A MOLE.

The Mole is a wonderful example of energy and power. Desiring to observe their methods of working when undisturbed, I once placed one in a five-acre clover-field, at 11 o'clock A.M. During the first seven hours it had tunneled twenty-three feet, in a zig-zag line. During the next seventeen hours it dug thirty-five feet, and

[1] *Sca'lops a-quat'i-cus.*

during the next hour, ten feet more. The total work consisted of sixty-eight feet of main line, and thirty-six and a half feet of branches, making in all one hundred and four and a half feet.

An observing farmer-boy, named Lawrence



1. End of nose. 2. Left forefoot.

STAR-NOSED MOLE.

Miller, once gave me a clear and intelligent description of a Mole's burrow which he uncovered and observed closely. It was a dome-shaped hole, two feet below the surface of the ground, reached from above by a hole that ran down slanting into its top. The burrow was a foot wide at the bottom, where three small galleries ran off about six inches, in different directions. Near the top of the chamber was a sort of shelf, supporting a bed of soft material, and on this lay a Mole. The young are usually two in number.

Besides the Common Mole, of the Eastern United States generally, we have the *Prairie* or *Silver Mole* of the prairie regions of the Mississippi Valley; the *Hairy-Tailed Mole* of the Eastern United States, and the *Oregon Mole* of the Pacific slope. The *Star-Nosed Mole*, of the northeastern United States and Canada, is quickly recognized by the remarkable star-like appendage of eighteen ray-like points, with four more between them, on the end of its nose.

THE SHREW FAMILY.

Soricidae.

North of Mexico, this Family contains about thirty-five full species, distributed throughout nearly every portion of North America south of a line drawn from the mouth of the Mackenzie River to Labrador. With most cheerful indifference, they inhabit mountains, plains, swamp lands and sandy sea-coasts, hot countries and cold. Everywhere, however, their noses are long and sharp, their eyes and ears minute, and the colors of all species are very sober, ranging from dull gray to brown, and ending in black. There are two species which are so widely distributed they may well be taken as types of the entire thirty-five.

The Common Shrew[1] is found on the Atlantic coast, from New England northwestward to Alaska, and southward through the Appalachian Mountains to Tennessee and North Carolina. Its color is brown above, and dull gray underneath; head and body, $3\frac{3}{4}$ inches long, tail, $1\frac{5}{8}$ inches. The ground plan of its skull is a perfect triangle spreading thirty-five degrees, and is very flat. Although very soft and fine, its fur is not so velvety as that of a mole. This creature is very small, and quite mouse-like in appearance.

Unlike the mole, Shrews occasionally emerge from their burrows, and wander about near their entrances. But they are exceedingly shy, and although they are frequently thrown out by the spade or plough, they are very rarely seen moving about. Above ground they are very helpless, and being unable to run rapidly, they try in a feeble way to hide. When taken in the hand, the musky odor they emit is rather disagreeable.

The Short-Tailed Shrew[2] is another type worthy of special mention. It is readily recognized by its very short tail, only 1 inch in length, while its head and body measure 4 inches. Its color is smoky brown above, and dull gray underneath, and in size it is the largest

1. COMMON SHREW. 2. SHORT-TAILED SHREW.

of the Shrews. It is found from the eastern edge of the Great Plains to the Atlantic coast, and is one of the largest members of the Shrew Family.

[1] *So'rex per-son-a'tus.* [2] *Bla-ri'na bre-vi-cau'da.*

CHAPTER VI

THE ORDER OF BATS

CHIROPTERA

The strange wing-handed, flying mammals composing this Order exhibit differences in form that are fairly bewildering. They range all the way from the beautiful to the fantastic and the hideous, and some of them are well worthy of study.

members of the Bat Order as a whole are almost as little known as the whales and porpoises of the deep sea. Our lack of acquaintance with bats is due chiefly to their nocturnal habits, and the consequent difficulty in observing them. To-day, bats are so little known that there are

Drawn by J. Carter Beard. From a specimen in the Philadelphia Academy of Sciences.

BORNEAN NAKED BAT.

The young are carried in two dorsal pouches, from one of which, under the left elbow, a small head protrudes.

The great majority of bats are useful to man in destroying the insects which, without the aid of the birds and beasts, very soon would overwhelm him. The harmful species are those which destroy fruit, and a few which suck the blood of domestic animals.

Owing to certain natural conditions, the perhaps a million persons who only know that they fly at night, and are "awful things to get into your hair."

I have seen thousands of bats, flying in many different places, but never yet saw one alight upon a woman's hair; and I believe they are no more given to doing so than are humming-birds.

From the bats of the United States, there is nothing to fear, for their claws and teeth are pitifully weak. One cross old "bumble-bee," angrily bumbling, is more dangerous to a peaceful community than all the bats of our country taken together. In some portions of South America, however, the vampire bats cause serious trouble.

Keen-eyed boys and girls all over the world should know that little is known concerning

SKELETON OF PALE BAT.
Antrozous pallidus.

the habits of bats, and much remains to be found out. These creatures are therefore excellent subjects for original investigation.

The Order of Bats as a whole contains about four hundred and fifty species, but it is safe to say that three-fourths of them are known only by their dry skins and skulls, and that their habits are quite unknown. The questions are,—why do bats live? Upon what do they feed? Are they useful to man, or injurious? What are their friends and their enemies? Do they migrate, and at what times? Where do they nest, or take shelter; and what are the facts about their young? What parasites and diseases have they?

Although the bat is a true mammal, it is almost as wide a departure from the ordinary, four-legged, land-going type as is a whale or manatee. Its hand reveals an extreme degree of what is called "specialization." For a mammal, the arms are of great length. The bones of the fingers are enormously extended, and connected with hairless skin as flexible as india rubber, to form a wing for flight. This wing membrane is extended on up the arm to the body and the legs, and is continued between the legs and tail, where it forms a supporting parachute in flight.

The thumb of a bat is very short and free; and its nail is developed as a hooked claw, by the aid of which the creature can comfortably climb about or support itself. The favorite position of a bat at rest is hanging by its feet, head downward.

To be "as blind as a bat" is not to be blind at all, but rather to possess powers of vision that are uncommonly good in semi-darkness, or at night, and fairly good even in the broad light of day. When disturbed at midday, all the bats I have ever seen alive (perhaps twenty species in all) have flown away to places of security as briskly and successfully as so many swallows. The eyes of all night-flying bats are small, jet black, and look like tiny black beads, but those of the day-flying fruit-bats are very much larger in proportion.

The teeth of bats of different species show wide variation. In nearly all of the four hundred and fifty species, the canine teeth are as strongly developed as in the cat, and in some bats their proportions are really formidable. A careless examination of a bat's skull might easily lead one to believe that it belonged to a carnivorous animal. But the molar teeth will always tell the true story.

The insect-eating bats, which far outnumber all others, have cheek-teeth which terminate in sharp points, and are specially designed for cutting to pieces the hard parts of hard-shelled insects. The fruit-bats, however, have molars of a very different sort, with rather smooth crowns, for crushing instead of cutting. The blood-sucking vampire bats of South America have very large canine teeth with sharp, cutting edges, and even the molar teeth are formed with scissor edges, very much like the teeth of cats.

The teeth and skulls of bats exhibit many interesting and even extraordinary variations, but it is impossible to enumerate them here. The accompanying figures show the characters of two species found in the United States.

As previously remarked, very little is known regarding the habits of bats, chiefly because their nocturnal habits make it very difficult to find them, or to observe them. We know that in winter some of our species live in caves, in a semi-dormant condition. Dr. C. H. Eigenmann

says, of the thousands that inhabit Mammoth Cave, "they fly readily if disturbed in summer, but in winter they hang apparently dead. If disturbed, a few respiratory movements may be seen, and they may utter a few squeaks, when they again remain apparently lifeless. If knocked from the roof some of them fall to the bottom of the cave and flap about, others fly away. I have seen them leave a cave in mid-winter, after being disturbed, but fly no further than a hundred yards, then turn and enter the cave again."

In central Montana, where there are no trees, I once found a large colony of bats inhabiting a cave that a subterranean stream had washed under the prairie. In Arizona there is a cave which is said to contain "a million" bats. Once while hunting elephants in the Malay Peninsula, the attention of my companion and myself was arrested by a strange, pungent odor which filled the air. Upon investigating the cause of it, we discovered a large cave of a very interesting character, inhabited by thousands of bats, and floored with a layer of bat guano a foot or more in depth, representing the accumulation of a century.

In warm countries, bats inhabit hollow trees. But do they inhabit such homes, and actually *hibernate in them in winter*, in the temperate zone? On this point, direct evidence is desirable. Dr. C. Hart Merriam has proved that some bats of the North American temperate zone do migrate, as birds do, going south in winter and returning in spring.

The conditions of wild life in the temperate zone are rather unfavorable to the development of large bats, and for this reason none of the bats of the United States are of large size or commanding importance. The large fruit-bats, or "flying foxes," can exist only where they can procure a good supply of fruit all the year round; and for this reason they are mainly confined to the tropics. During our northern winter, a true vampire bat could indeed prey upon the blood of domestic animals; but in zero weather, the naked wings of such a creature would freeze stiff in a very few moments. The large vampire bat of India, for some reason called the "false" vampire (*Meg-a-der'ma ly'ra*), which devours small frogs, fishes, small birds, and even bats smaller than itself, could live in our southern and southwestern states, but it would be impossible for it to go far north of the frost line. All bats inhabiting the colder regions of the temperate zone, within the snow limit, must either hibernate in winter, without food, or migrate.

Owing to the great number of species of bats, and of the many groups into which they have been divided, it is desirable to mention here only a few examples with which every intelligent person should be acquainted.

The bats have been divided by Nature into two Suborders, and six Families, as follows:

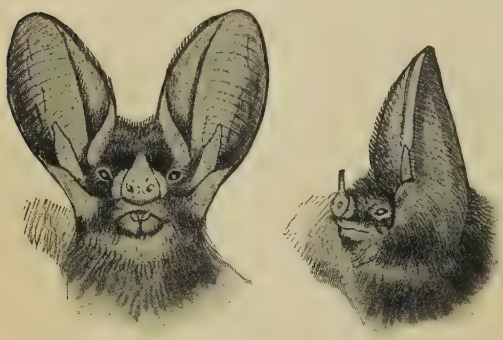
THE ORDER OF BATS

	SUBORDERS.	FAMILIES.		EXAMPLES.
ORDER CHIROPTERA.	Insect-Eating Bats: *Mi-cro-chi-rop'-ter-a.*	Leaf-Nosed Bats, .	*PHYL-LOS-TO-MAT'I-DAE.*	**Leaf-Nosed Bat.** **Blainville's Bat.** **Javelin Bat.** **Great Vampire.**
		Free-Tailed Bats,	*EM-BAL-LO-NU'RI-DAE,* .	**Bonneted Bat.** **Naked Bat.**
		Common Bats, . .	*VES-PER-TIL-I-ON'I-DAE.*	**Red Bat.** **Gray Bat.** **Big-Eared Bat.**
		False Vampires, .	*MEG-A-DER-MAT'I-DAE,* .	**False Vampire.**
		Horseshoe Bats, .	*RHI-NO-LOPH'I-DAE,* . .	
	Fruit-Eating Bats: *Meg-a-chi-rop'-ter-a.*	Flying Foxes, . .	*PTER-O-POD'I-DAE,* . .	**Flying Fox.** **Hammer-Headed Bat.**

THE FAMILY OF LEAF-NOSED BATS.

Phyllostomatidae.

The members of this Family bear on their noses thin leaves of naked skin that stand erect behind, or partly around, the nostrils. These wonderful nose-leaves are pear-shaped, heart-shaped, wedge-like, and of many other forms. The ears are large, or very large; the wing membrane reaches down to the foot; the tail is long, and sometimes extends a short distance beyond the interfemoral membrane. On the whole, the bats of this Family form an astonishing exhibit of facial oddities. All save a few species are confined to South America.



CALIFORNIA LEAF-NOSED BAT.
(After Harrison Allen.)

The California Leaf-Nosed Bat[1] may be taken as a very modest example, because it bears what is really a very simple form of nose-leaf. It is found in southern California and Mexico, and its pelage is very light-colored.

The most remarkable of all bat faces is that of a small, brown-colored West Indian species known as **Blainville's Bat.**[2] As a sport of Nature it stands fairly unrivalled, and shows what is possible in the fashioning of skin into ornamental forms. The ears are large and of most fantastic form, the chin is bedecked with a highly convoluted bib of skin, and the eyes and nostrils are almost lost amid the leaves and tubercles which cover the muzzle. As a whole, the appearance of the face of this bat suggests a highly complicated flower, like a double pansy. The skull is only five-eighths of an inch in length. This species is quite uncommon, and practically nothing is known of its habits.

[1] *O-top'ter-us cal-i-for'ni-cus.*

[2] *Mor'moops blain'vill-ii.*

In fashioning the noses and ears of bats, Nature has done some very odd and curious work. The flowers of orchids are not more oddly fashioned than the heads and faces of some species.

Let it not be supposed, however, that these queer facial appendages and long ears of the leaf-nosed bats are purely ornamental. Dr. George E. Dobson, one of the greatest authorities on bats, has pointed out two very curious facts. (1) The bats with small ears and *no nose-leaves* fly most in the early twilight; and many, such as the fruit-bats, fly in the daytime. (2) The long-eared and leaf-nosed bats prefer darkness, and seek their food only at night.

Let us see if we can find a reason for this. A cruel investigator of the eighteenth century, named Spallanzani, once destroyed the eyesight of several bats, then suspended many silken threads from the ceiling of a room, and liberated the creatures. Although totally blind, the bats flew to and fro between the threads, without once striking them, and were equally successful in avoiding branches of trees that were introduced. It now seems certain that some bats possess a sixth sense, of which at present we know nothing, by which they are able to fly in total darkness, and avoid even the smallest obstructions.

It seems quite probable that the long ears and nose-leaves of the night-going bats aid their owners in guiding their flight; but the precise manner in which it is done remains to be discovered.

The True Vampire Bats. — By this name we seek to distinguish the bats which actually suck the blood of living creatures, from the so-called vampires which live on fruit. In South America there are five species of true vampires, three of which are known as the javelin

BLAINVILLE'S FLOWER-NOSED BAT.
(After Peters.)

bats, the others as the short-nosed vampires. The centre of abundance of these creatures appears to be the valleys of the Amazon and the Rio Negro, and the adjacent regions; but one of the species ranges all the way from Chile to Mexico.

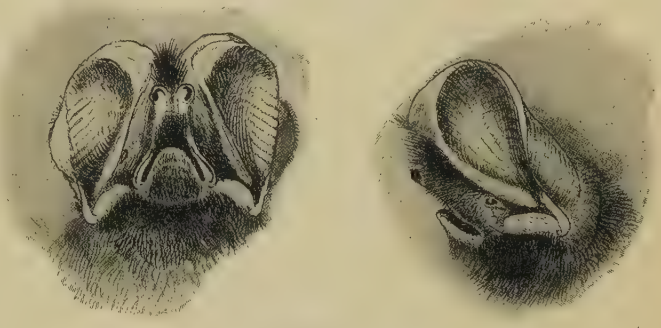
Of the true vampires, the **Javelin Bat**[1] is the one which is most aggressive, and most dreaded. It bites horses and cattle, usually on the shoulders, neck or hindquarters, and makes a wound in the skin of sufficient depth to cause blood to flow freely, even after the bat has flown away. Naturally, an animal that is thus preyed upon soon grows thin in flesh, and becomes visibly weakened. On the island of Mucina, in the delta of the Amazon, the serious injuries inflicted by the Javelin Bats upon domestic animals have long been known.

But where true vampires are abundant, they do not confine their attacks to domestic animals. Human beings are occasionally called upon to pay blood tribute to the small wing-handed demons of the air. Men are bitten at night, when asleep, usually either upon the nose, or the feet. With its sharp-edged teeth, the creature makes a very small round hole in the skin, and by means of mouth suction which must be quite powerful, the blood is soon flowing freely. Fortunately, blood-poisoning is not an attendant evil of the Vampire's bite, and the wound seldom becomes painful.

The common Javelin Bat measures a little less than 4 inches in length of head and body, and in color is reddish brown. All the other true vampires are smaller, and all are practically tailless, the parachute membrane stretching between the legs, quite down to the feet, without the support of tail vertebrae. Naturally, these creatures are widely known; for any bat which lives upon warm blood, always drawn from a living fountain, is bound to acquire wide notoriety and a very evil reputation. The skull of a Javelin Bat, seen in profile, looks very much like the skull of a miniature wolf.

In order to illustrate once more how easily a harmless animal can acquire an evil reputation, and further emphasize the necessity of taking direct evidence before pronouncing a verdict, we introduce a 28-inch bat from South America, most unjustly called the **Great Vampire**,[2] but not really belonging to the genus of blood-suckers. Mr. H. W. Bates, the "Naturalist on the Amazon," lived for a time where this species was quite abundant, and of it he wrote in his book as follows:

"Nothing in animal physiognomy can be more hideous than the countenance of this creature when viewed from the front; the large, leathery ears standing out from the sides and top of the head; the erect, spear-shaped appendage [nose-leaf] on the tip of the nose, the grin, and the glistening black eye, all combining to make up a figure that reminds one of some mocking imp in a fable. [The very savage-looking canine teeth might well have been mentioned, also.] No wonder that imaginative people have inferred diabolical instincts on the part of so ugly an animal. The Vampire, however, is the most harmless of all bats." Mr. Bates opened the stomachs of a number of specimens, and found that "they had been feeding chiefly on fruits," and wild fruits, at that, obtained by honest hunting in the depths of the forest.



BONNETED BAT.
Promops californicus. (After Harrison Allen.)

Moral: Never make an affidavit on the food habits of wild animals without first examining the stomachs of several specimens.

THE FAMILY OF FREE-TAILED BATS.

Emballonuridae.

The bats belonging to this Family have no nose-leaves, and the tail is partly free from the

[1] *Phyl-los'to-ma, has-ta'tum.*

[2] *Vam-py'rus spec'trum.*

membrane between the legs, either rising from its upper surface, or projecting beyond its end. The muzzle is rather blunt, and the nostrils open beyond the upper lip.

The Bonneted Bat,[1] of California and Mexico, is one of the largest of our species of free-tailed bats. Above the shoulders it looks like a rat wearing a poke bonnet. Its head-and-body length is 2¾ inches, tail 1¼, total length of ear, 1⅝ inches. One-half the tail is free.

The Naked Bat,[2] of Borneo, Java and Sumatra, is one of the most remarkable species of the entire Order of Bats, and in some respects is the widest departure from the typical bat. In the interior mountains of Sarawak, Borneo, I once secured ten fine specimens, and to me they are as wonderful to-day as when handled for the first time.

As its name implies, this bat is practically destitute of hair, the only hair noticeable being a few stiff, black bristles on the neck, and a little microscopic fuzz on the breast and hind-quarters. The skin is thick and leathery, lying in numerous creases and folds, and on the living animal it is very elastic. There is no nose-leaf, and the lips are very thick and fleshy. The tail is free of parachute membrane for two-thirds of its length, and is quite like the tail of a mole. On the joint at the base of the thumb there is a large, callous tubercle, which indicates that this bat is much given to crawling about on "all fours," on rocks and tree-trunks.

Around the neck, the skin lies in two thick folds, and in these, directly under the chin, is situated a deep gland or sac which secretes a gummy substance with an odor both strong and disagreeable. Clearly, like the scent-gland of the skunk, it is for defence.

The most wonderful feature of the Naked Bat is yet to be noticed. On seeing this species for the first time, one's first thought is, how do the young bats cling to the parents during flight?

Nature, ever wise and provident, has answered this question by placing under each arm of this bat *a deep, wide pocket of rubber-like skin, in which the young are carried until they are able to fly!* The mouth of this pocket is on a line between the elbow and the knee, and it extends upward and backward, over the entire shoulder, quite to the back-bone, where the two sacs are separated by a thin partition of skin. The pouch is 1¾ inches deep, and in its lower portion, against the ribs, is located the mammary gland. On the whole, this is the most wonderful infant-pouch possessed by any living creature, not even excepting that of the marsupials, which is much more simple.

My largest specimen of this bat had a head-and-body length of 5½ inches, tail 2 inches long, and a wing expanse of 22 inches. In the skin were many curious folds. The face of the Naked Bat is coarse and ugly, and the body is quite devoid of grace and beauty; but ere one has time to scoff at such homeliness, the creature seems to say,—"Study me; for I am fearfully and wonderfully made!"

This bat lives upon fruit and vegetation, and nests in hollow trees, rock crevices, or in holes in the earth. The illustration on page 59 was drawn from one of my Bornean specimens.

THE FAMILY OF COMMON BATS.

Vespertilionidae.

These are the bats that are most widely known, and also the most numerous. Dr. E. L. Trouessart recognizes more than 200 species. They range over all portions of the world that are habitable by small bats.

The distinguishing characters of the members of this Family are chiefly negative. There are no nose-leaves, the nostril openings are simple, and the tail is not produced to any extent beyond the interfemoral membrane.

All the bats of the United States are of small or medium size, and the majority of them belong to this Family. Along the Atlantic coast, they are so common that nearly every person living beyond the confines of the great cities is personally acquainted with at least one species. The commonest is the beautiful little **Red Bat**[3] which appears in the early twilight, gliding on swift yet noiseless wings up and down the shaded streets and roads, and occasionally making a friendly diversion into an open window, or through your veranda, partly for business purposes, and partly as an evidence of friendly regard.

[1] *Pro'mops cal-i-for'ni-cus.*
[2] *Chei-ro-me'les tor-qua'tus.*
[3] *Las-i-u'rus bo-re-al'is.*

In midsummer, sharp eyes sometimes find this bat hanging close in amongst the leaves of a chestnut tree, its delicate fur as red as the brightest iron-rust. Touch it ever so gently and whisk! it is off as swiftly as a swallow, to seek another and a better hiding-place.

From sunset until it grows quite dark, it is very busy, and constantly on the wing. The

THE RED BAT.

Red Bat is a swift flyer, and much more of an aerial gymnast than any bird I know. In its flight it can turn abruptly with marvellous precision, and to me it is a constant source of wonder that it can fly so rapidly, turn and double so quickly, and dart in all possible directions without striking something. Almost any bird attempting to fly over the course of a Red Bat, and at the same speed, would probably come to grief in a very short time.

The only mistake that Red Bats are prone to make is in flying into houses through open windows, and instantly forgetting the location of the means of escape. Once in a room, the bat flies slowly, and frequently is so bewildered by the sudden change from semi-darkness to light that it strikes a wall, and falls to the floor. Although many persons are nervous about bats, I have noticed that whenever one flies in, some kind-hearted and sensible person generally cries out, "Don't kill it!"

While crossing the Atlantic quite recently a British **Long-Eared Bat** was found on board the steamer, thirty miles from the nearest land, clinging to the rail, wet and weary. At that time there was no breeze from the land.

When taken into the library, its wet fur soon dried, and it began to fly to and fro. In a short time the room was well filled with passengers, who watched the exhibition with great interest. When caught and held for close examination, it did not squeak shrilly and protest as the red bat usually does. After having served as a useful object lesson for a large number of young people, our strange visitor was brought safely to New York harbor, and liberated.

The Gray Bat[1] is one of the largest and handsomest species inhabiting the northeastern United States and Canada. It is also found throughout the middle West from Ohio to California, and from Manitoba to New Mexico. This is a species well worth looking for. It has small ears, a head-and-body length of 3 inches, tail 2 inches, and it is readily distinguished by its dark brown hair tipped with silvery white.

The Big-Eared Bat[2] of the south Atlantic states has ears of incredible height and width for a creature so small. In comparison with the size of the wearer, these ears are the largest worn by any American mammal. They are one-half as long as the entire head and body, being $1\frac{1}{4}$ inches in height and nearly 1 inch wide, while the head and body measure only $2\frac{1}{2}$ inches.

THE FAMILY OF FALSE VAMPIRES.

Megadermatidae.

This Family is absent from America, but is mentioned here to fill what otherwise would be a gap. The members of one genus, *Megaderina*, are noted for their carnivorous habits. The most noteworthy species is well worthy of mention.

The "False" Vampire Bat, of India and beyond, bears a name which is quite misleading; for in its habits, this creature is far from being a "false" Vampire. It devours frogs, small fishes, bats smaller than itself, and even

[1] *At-a-la'pha cin'e-re-a.*
[2] *Co-ry-norhi'nus ma-cro'tis.*

small birds. It has very large ears, an elaborate nose-leaf, a head-and-body length of 3 inches and a wing expanse of 16 inches.

THE FAMILY OF HORSESHOE BATS.

Rhinolophidae.

This Family contains thirty species of small bats, all of which are restricted to the Old World.

THE FAMILY OF FRUIT-EATING BATS.

Pteropodidae.

The members of this Family are bats of very large size, with fox-like heads, dense and abundant pelage, large eyes, and free tails when tails are present. They are quite diurnal in their habits, and feed almost exclusively upon fruit. They inhabit India, Ceylon, the Malay Archipelago and eastern Australia, and are almost the only bats that find their way into captivity for exhibition purposes. They are very sociable in their habits, and live in colonies of from five to fifty individuals.

The Flying "Fox." [1] The largest of the bats which we occasionally see darting through the gloaming with irregular, jerky flight, are about as large as purple martens,—tiny creatures, weak, and quite incapable of offence. In the East Indies, however, and also Australia, there are bats of enormous size. These are known as **Fruit Bats,** or **Flying "Foxes."** Some of those shot by the author in Ceylon had wings which spread forty inches.

On one occasion I found the top of a small tree, about fifty feet high, filled with these animals. They hung head downward from the upper branches, in places so thickly as to crowd each other,—quarrelling, squealing shrilly, and climbing about. To see nearly a hundred bats of such huge size hanging in one tree-top, quite at home in the broad glare of a tropical afternoon sun, was a strange and impressive sight. I had been asked to procure and preserve for American museums six dozen specimens of that species, and when after long observation I finally fired into the bunch, the black and brown cloud of giant bats that rose in the air, and slowly flapped away, was one of the most grewsome sights I ever saw in animal life. Of all creatures that fly, none are so thoroughly uncanny when outlined against the sky as the big, black-winged, half-naked Flying "Fox." They suggest demons and calamities.

The Flying "Fox" derives its name from the resemblance of its head to that of a very small fox. It feeds wholly upon fruit, and when it inhabits well-settled districts it is cordially disliked by every person who owns a fruit-tree. In some portions of Australia, these creatures have done great damage to fruit, and energetic measures, such as the explosion of dynamite among them, have been resorted to for their destruction.

Some of the fruit-growers of California are so apprehensive of this creature, and so fearful that it might be "introduced," they have secured the passage of a law, by which the importation of the Flying "Fox" is prohibited so rigidly that not one specimen can be imported, even for exhibition in a zoological garden. As a matter of fact, this fear of the presence of the Flying "Fox" in the United States is quite as groundless as the old fear of being quill-shot by Canada porcupines. It certainly would be very difficult to introduce that species, and keep it from being exterminated, except possibly in some of our insular possessions.

In the Flying "Fox" Family is found another remarkable variation in bat physiognomy, the **Hammer-Headed Bat,** [2] a species discovered in the land of the gorilla, by Du Chaillu. The head of the animal is of large proportions as compared with the body, and the muzzle is enormously enlarged. In general outline, the head in profile is much like the head of a moose. This is quite a large bat, its wing expanse being 28 inches.

HAMMER-HEADED BAT.
(After Joseph Wolf.)

[1] *Pter'o-pus ed'wards-i.*

[2] *Ep-o-moph'o-rus.*

FRUIT-EATING BATS, OR FLYING "FOXES."

CHAPTER VII

THE ORDER OF GNAWING ANIMALS

GLIRES, OR RODENTS

The Order of Gnawing Animals contains a great many species, and to persons who have not studied it with some attention, it is a chaotic jumble of living creatures. This unsatisfactory condition is entirely unnecessary. A few hours' diligent study—under helpful conditions—will give any intelligent person a fair knowledge of the subdivisions of this Order, and an acquaintance with a sufficient number of examples so that each strange North American rodent met with can be referred to its proper Family.

The first step is to learn the names of the Families, which are as follows:

ORDER GLIRES, OR RODENTIA. (North of Mexico.)

FAMILIES.		APPROXIMATE NUMBER OF FULL SPECIES.
Squirrel Family,	*SCI-U'RI-DAE,*	about 72 Species.
Sewellel Family,	*AP-LO-DONT'I-DAE,*	4 "
Beaver Family,	*CAS-TOR'I-DAE,*	1 "
Mouse and Rat Family,	*MUR'I-DAE,*	171 "
Pouched Mouse and Rat Family,	*DI-POD'I-DAE,*	42 "
Jumping Mouse Family,	*ZA-POD'I-DAE,*	10 "
Pocket Gopher Family,	*GE-O-MY'I-DAE,*	33 "
Porcupine Family,	*E-RETH-I-ZONT-I-DAE,*	2 "
Pika, or "Chief Hare" Family,	*O-CHO-TON'I-DAE,*	6 "
Hare and Rabbit Family,	*LE-POR'I-DAE,*	30 "
		371[1]

THE SQUIRREL FAMILY.

In order to avoid recognizing a large number of Families for animals that are closely related, zoologists have agreed that the Squirrel Family shall contain the marmots, and a number of other animals that are closely related to squirrels. To make this point clear, observe this diagram:

SQUIRREL FAMILY (in America).

True Squirrels,	Tree Squirrels,	*Sciurus.*
	Rock Squirrels,	*Tamias,* etc.
	Ground Squirrels,	*Citellus.*
Marmots,	Prairie-"Dogs,"	*Cynomys.*
	Woodchucks,	*Marmota.*
Flying Squirrels,		*Sciuropterus.*

All these creatures appeal strongly to persons who live in the country, or visit city parks. Go anywhere in the temperate zone, and you will find some of them, ready to greet you, and make friends with you if you choose. You have but to use your eyes, and you will see them. In the East you have the gray squirrel and chipmunk; in the Mississippi Valley the fox squirrel; on the Great Plains, the ground-squirrels and prairie-"dogs"; in the West the Douglas squirrel, and a bewildering array of chipmunks and ground squirrels. He who fails to learn their names, and make friends with them, loses much pleasure.

The members of the Squirrel Family are so widely distributed, and have grown so accustomed to man and his ways, that there are few persons who have not seen at least two or three wild species in their haunts. Their lives are full of incident and interest, and to the young naturalist, animal artist or sculptor, they are usually the most available of all wild animal subjects.

A very attractive book might be written

[1] The subspecies recorded number about 260 !

about the many beautiful and interesting species of squirrels that are found throughout North America, the number of which is surprisingly great. The total number of species and subspecies described is as follows.

In Mexico and Central America, species, about 25, subspecies, about 18, total 43; in the United States and Canada, species, about 60, subspecies, about 67. The total for North America is about 170 species and geographic races. Many of these, however, resemble each other so closely that their differences are too slight for our consideration; and there may be a number that are not entitled to stand as independent forms.

Nature has divided the many species of North American squirrels into three easily remembered groups, as follows:

Tree Squirrels, which live in the tree-tops. Example: Eastern Gray Squirrel.

Rock Squirrels, which live in rocks, fences and among the roots of large trees. Example: the Common Chipmunk.

Ground Squirrels, of prairie countries, which burrow deeply in the earth. Example: the Striped Spermophile.

In each of these three groups there are several important types which must be noticed.

The Tree-Squirrel Group.

A patch of timber or a wood lot without squirrels always conveys an impression of lonesome solitude and something gone,—like a country graveyard. There is no other animal of equal size that can add so much of life and cheerfulness to a hardwood forest or a meadow as a good healthy squirrel. *Why is it* that American men and boys kill them so eagerly? Surely the flesh of their little bodies is not needed as food. It has a taste so "gamey" and rank that to many persons it is decidedly unpalatable. Americans are the only white men on earth who eat squirrels. An Englishman would as readily eat a rat!

Possibly their flesh was necessary to the hardy but hungry pioneers of the early days; but today we have no excuse for shooting any squirrels, save the quarrelsome red squirrel. Surely no true sportsman or right-minded boy can find any real "sport" in "potting" squirrels out of the tree-tops.

Photographed by E. R. Sanborn, N. Y. Zoological Park.
GRAY SQUIRREL.

Take the common gray squirrel, for example. It is one of the most beautiful and graceful of our native mammals. It is perfectly harmless, and *as soon as it learns that it is protected, it becomes so tame as to be a delightful companion on the farm.* Thousands of American farmers would fight, were it necessary, to save their squirrels from slaughter. Except the red squirrel, all tree squirrels should be protected, both by public sentiment and by law.

Excepting the chickarees, the squirrels which live in the tree-tops are considerably larger than those of other groups, and their tails are much longer. Their characteristic colors are gray, rusty-brown, yellow and black; and as a rule

they are devoid of spots or stripes. They are very strong and active climbers, and keen of eye and ear.

The Gray Squirrel[1] is chosen as the leading type because it represents an average size, the most frequent color, and is widely distributed. This is the most prominent squirrel of southern Canada, New England, and the eastern and

SOUTHERN FOX SQUIRREL.

southern states, southward to Florida. It ranges westward to Minnesota, Kansas and Texas. Above its color is clean iron-gray, which in southern specimens is mixed with dull yellow. The lower surface is white, varying to yellowish brown. Usually it nests in hollow trees, but when crowded for room builds an open nest of green leaves, or strippings of cedar bark made into a round ball. The young are usually five in number.

[1] *Sci-u'rus car-o-li-nen'sis.*

The Gray Squirrel frequently consents to live in city parks, and becomes quite tame. It spends much of its time upon the ground, searching for nuts, roots, or anything which can be eaten. A very large specimen measures $9\frac{1}{2} + 8\frac{1}{2}$ inches. Northern specimens are larger, and have longer and finer fur than those of the southern states.

The California Gray Squirrel[2] is the Pacific coast counterpart of the eastern gray squirrel, except that it is larger, and its colors are brighter. Its color above is bluish gray and black, and underneath it is pure white. It is the largest squirrel in the far West, its maximum length being 12 + 10 inches. Its home extends from the state of Washington to southern California, and it is in every way a worthy product of that fertile and healthful region.

The Fox Squirrels.—We have now reached two important species, to which the student must give close attention in order to avoid confusing them with each other, and with the gray squirrel. The southern species will be presented first, because it has two points by which it can be recognized at a glance.

The Southern Fox Squirrel[3] is the only Squirrel in America which has a *pure white nose* and *white ears*. No matter how much the remainder of the animal may vary in color from the standard, in adult specimens the white nose and ears are constant. Typical specimens of this species are colored as follows: top of head, black; upper surface, blackish brown; lower surface, lighter brown; tail, dark brown, margined with black.

Variations occur, of every shade from the above to jet black all over the body, head and tail; but the ears and nose still are white.

This animal measures 13 + 12 inches. Its home is east of the Alleghanies from Virginia to Florida, and westward along the Gulf Coast to Louisiana. On the map its range looks like an arm bent around the range of the next species.

The Northern Fox Squirrel,[4] or **Cat Squirrel,** is smaller than the southern species (12 + 11 inches), but very much like it in color, save that its nose and ears *never* are *white*. The standard color is rusty brown, washed with black on the upper surface, and bright brown underneath.

[2] *Sci-u'rus gris'e-us.* [3] *Sci-u'rus ni'ger.*
[4] *S. lu-do-vi-ci-an'us.*

Variations.—This squirrel is the most variable in color of all our species, and in fifty specimens it may be difficult, or even impossible, to find two exactly alike. Often it has a beautiful gray coat, and looks like a genuine gray squirrel with a brown back and head. Often it is dark gray above, and black on the legs and under surface,—a strange combination of colors,—and occasionally a pure white specimen is found.

This species inhabits the Mississippi Valley from the Alleghanies to Arkansas, western Iowa, and northward to Michigan and New York. In captivity it seems to be more hardy in winter than the gray squirrel. In the New York Zoological Park it blithely runs about in the snow when the latter takes pains to avoid it. Often the Northern Fox Squirrel will be out when none of the other occupants of the Rodents' cages are visible. It seems to me, however, that the Fox Squirrels are not as nimble on foot, or as active and daring in the tree-tops, as the gray squirrels.

EASTERN RED SQUIRREL.

The Red Squirrel, or **Chickaree,**[1] represents a large group of species containing the smaller of the tree squirrels. Its length is $7\frac{5}{8} + 5\frac{1}{2}$ inches, weight $7\frac{1}{2}$ ounces. What it lacks in size it makes up in courage and activity. In New York and New England, it often drives all the gray squirrels out of any grove which they have undertaken to inhabit as tenants in common. Many observers believe the habits of the Red Squirrel to be so bad that the species deserves to be exterminated; but to this we are not prepared to agree. The complete destruction of any species of mammal or bird is a doubtful experiment, and never should be entered upon without most careful investigation.

In its normal colors, this little animal is readily recognized by its brown upper surface and outer surface of its legs, and its white under parts. It must be remembered, however, that it undergoes important seasonal changes in pelage,—from winter coat to summer coat, and the reverse,—and sometimes its standard colors are greatly changed.

Its legs are long and thin in proportion to the size of its body, and its form is not as graceful as that of the gray or fox squirrels. It is readily recognized by its markings, and the fact that it is the smallest of our northern tree squirrels.

Three species and fifteen subspecies of Red Squirrels are recognized, and their combined ranges cover about two-thirds of North America, from Alaska and Labrador to North Carolina and southern Arizona.

In California and Oregon this group is represented by the sprightly and interesting **Douglas Squirrel,**[2] showing a mixture of colors,—dark gray, yellowish, and black. This is the most familiar squirrel of the great coast forests, in which it uses the sides of the giant spruces and redwoods as play-grounds. In Colorado and Utah occurs the third full species, known as **Fremont's Squirrel,**[3] which is colored gray, yellowish brown and white, much mixed.

Of the forty-three species and races of squirrels inhabiting Mexico and Central America, the most conspicuous is the **Red-Bellied Squirrel.**[4] Its upper surface is pale grizzled gray, and its under parts bright rusty red. It inhabits the forests of eastern Mexico, ascending the high mountains to an elevation of 8,000 feet.

The *largest squirrel* in the world is the great **Malabar Squirrel**[5] of southwestern India, which is yellowish brown above, reddish brown or black below, and measures, head and body, 17

[1] *Sci-u'rus hud-son'i-cus.*

[2] *Sci-u'rus doug'las-i.* [3] *S. fre-mont'i.*
[4] *S. ery-thro-gas'ter.* [5] *Sci-u'rus mal-a-bar'i-cus.*

inches, tail, 14½ inches, and it weighs 4½ pounds.

The *most beautiful* squirrel in the world is **Prevost's Squirrel**[1] of the Malay Peninsula, a species about the size of a small gray squirrel. Its colors form a beautiful pattern of gray, brown, black, white and buff.

Rock Squirrels, or Chipmunks.

Next below the tree squirrels comes a large group of small squirrels which live on the ground,

EASTERN CHIPMUNK.

preferably amongst rocks, in which they find refuge from their enemies. In the absence of rocks, they live along fences, where any exist; but their favorite nesting-places are in hollow trees which can be entered directly from the ground.

These little creatures are about one-third the size of large tree squirrels, and inasmuch as their small size renders them secure from the deadly attentions of man, they have become the most tame and confiding of all the wild mammals of civilization. They are graceful in form, beautiful in color-markings, and exceedingly pert and quick in their movements. When fully protected, as they are in some public parks, they become so tame and confiding that they dart about on the walks in search of food, and often allow persons to pass within three feet of them.

For convenience and clearness, we shall designate all the chipmunks as **Rock Squirrels,** because of their well-known preference for rocks, whenever any are available. It is a mistake to call these animals "ground squirrels." That name does not properly apply to them, but belongs to the next group.

The Eastern Chipmunk[2] is widely known, and will serve admirably as the key to the group. When you walk in the country, almost anywhere in the eastern states, this pretty little creature darts in front of you like a flash of brown light, and says, "Chip, chip, chip, chip!" most gleefully. If you stop to observe him, he pauses and looks at you very intently, wide-eyed and with ears erect, and save for the quick heaving of his tiny sides, remains as motionless as a stuffed squirrel.

To him, every fence is a fortress. Whether it be of stone or wood, the Chipmunk knows its best runs when danger threatens, and carries in his active little brain a complete check-list of burrows and hiding-places. When pursued by dog, boy or wild animal, he darts swiftly along the top or the lower rails of his stockade, until he reaches a satisfactory hiding-place, when a flash of brown fur shoots into it, and he is seen no more.

When hard pressed, Chipmunks frequently climb tree-trunks up to the lower branches, but such situations are very dangerous for them, because they are so seriously exposed to attack. Next to the birds of prey, the weasel, mink and fox are their worst enemies. The weasel is the worst of all, because it follows them into the remotest recesses of their burrows, and kills every inhabitant without mercy.

Although the Chipmunk burrows in the ground below the frost line, and has roomy cheek-pouches in which it carries astonishingly large quantities of grain and small nuts, it is more nearly related to the tree squirrels than to the true ground squirrels. In the autumn it stores in its burrow a quantity of grain or nuts, whichever is most abundant,—a habit which has sug-

[1] *Sci-u'rus pre-vost'i.*

[2] *Tam'i-as stri-a'tus.*

gested its generic name, *Tamias*, meaning a steward. It does not become dormant, but on the warm, sunny days of winter, when the rocks are free from snow, it hastens above ground to enjoy the light and warmth.

The length of an Eastern Chipmunk is $6\frac{1}{2} + 4\frac{1}{2}$ inches. Its ground color is bright reddish brown above, light underneath, and along each side runs a conspicuous yellow-brown stripe between two black stripes. A black stripe runs from the head backward along the centre of the back, almost to the tail. The home of this animal extends from southern Canada and New York to Georgia and Louisiana, and westward to Iowa.

There are eighteen full species of Chipmunks, several of which are very much alike, distributed throughout nearly the whole of the United States. The greater number are marked by two or more black lines extending along the side, frequently alternating with lines of a yellowish-gray color.

It is impossible to mention even the majority of these species without risk of confusing the reader, but it is desirable to note a few important and strongly marked types inhabiting widely separated localities in the United States.

The California Chipmunk[1] is a merry-hearted little elf, particularly pert and beautiful. Its high, sharp-pointed ears and harlequin stripes of white give it a very roguish and saucy look. To judge by the lively actions of this little creature, it seems to regard life as a long play-spell. There are many in the Zoological Park, and in some respects they are the most satisfactory of all our burrowing rodents. Only the severest weather drives them into their burrows, and in the dead of winter, when a thick blanket of snow keeps all other animals of the Burrowing Rodents' Quarters snug under ground, the first hour of clear sunshine will see half a dozen of the California Chipmunks above ground, and sunning themselves on their logs. Having an abundance of room, they enjoy their life in the Park, and are much interested in visitors who notice them.

This species could easily and safely be introduced in any region suitable for it. Its home is in the San Bernardino and San Jacinto Mountains, California, but the limits of its range are yet to be defined. It is one of the smallest species of its genus, its total length being 6 + 3 inches.

[1] *Eu'tam-i-as spe-ci-o'sus.*

The Antelope Squirrel[2] is readily recognized by the broad and conspicuous band of white, which extends along the middle of the side, and its pale buff color. It has the pale colors of a desert animal. It is found in the desert regions of the southwest from western Texas to southern California, and northward to Nevada and Utah.

It is larger than the eastern species, and is strikingly different in appearance from all other chipmunks.

Photo. by E. D. WARREN.

SAY'S SPERMOPHILE. (*Callospermophilus lateralis.*)

WESTERN CHIPMUNK. (*Eutamias quadrivittatus.*)

Ground Squirrels.

We have now reached a large group of burrowing squirrels which to the farmers west of the Mississippi are of very serious importance, on account of the grain they destroy. All these animals may be known under the name of Sper'-mo-philes. The word Spermophile means "seed-lover"; and as this very appropriate general term implies, the animals which bear it feed chiefly upon seeds or grain.

No ground squirrel, or spermophile, ever should be called a "gopher," as is frequently done in the Dakotas and Minnesota. The latter name should be reserved for the clumsy, burrowing pocket gophers, of the genera *Geomys* and *Thomomys*.

Ground squirrels live by preference on prairies,

[2] *Am-mo-sper-moph'i-lus leu-cu'rus.*

and burrow deeply in the ground. They seldom frequent rocks, and seldom climb trees. They are essentially dwellers in open country, where they can range freely, and behold a goodly portion of the world about them. Even fields of standing grain are distasteful to them, and they move to the open country around their borders.

Of spermophiles north of Mexico there are thirty-one full species and forty-two subspecies, or races. Going westward, they are first found in western Indiana and Michigan, from which they spread northwest and southwest throughout the whole western half of the United States, save the timbered areas. They also range into Mexico, Canada, and Alaska. They are at home on the rich, rolling prairies of the Dakotas, the level, floor-like plains of Nebraska, the alkali flats of Utah, the hot deserts of Arizona, and the dry valleys and mountain regions of California. They seem to be most numerous in California and the Dakotas, where they do much damage to crops.

All the ground squirrels have cheek-pouches, dig deep burrows (unless the earth is too rocky), store quantities of grain in the autumn for winter food, and in cold latitudes live all winter in their burrows. If forced to do so, they will live amongst rocks, and it is surprising to note how they can live in situations both high and low, dry and wet. Their favorite food is grain, seeds of every description, green grass, and hay, and their worst habit is digging up seed grain.

Some species eat quantities of destructive insects, such as grasshoppers, beetles, cut-worms, and crickets, and in this way partly compensate the farmer for the grain they devour. In fact, from all observations made thus far it seems that in the insect season, insects form a considerable proportion of the daily food supply of these industrious little animals. Not only do they eat all kinds of ground insects, but they also devour mice, and almost any other flesh that comes within their reach, particularly dry meat adhering to the bones of large animals which have died near their holes.

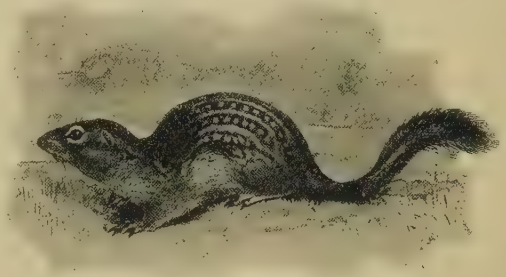
Ground squirrels are prolific, and bring forth from seven to ten young in each litter. Their enemies are coyotes, foxes, badgers, skunks, hawks and owls.

The spermophiles of North America are so wide-spread, so numerous and so important it is necessary that two or three of the leading species should be specially noticed.

The Thirteen-Lined, or **Leopard Spermophile,**[1] is the most familiar and widely distributed species, and although one of the smallest, it is also the most strangely marked. Nature was in a sportive mood when she marked the back and sides of this little creature with seven broad stripes of dark brown, then laid between them six narrow stripes of pale yellow, and finally marked each of the seven brown stripes with a row of large, pale yellow spots. The yellow spots on the brown lines are the first feature of the color scheme to catch the eye, and they distinguish this animal almost as far as it can be seen. Its under parts are pale yellow, and its size is $6\frac{1}{2} + 3\frac{1}{2}$ inches.

Do not call this animal the "Striped" Spermophile, because that name would apply to several other species, and be worthless; and do not call it the "Striped Gopher," because it is not a "gopher" *of any kind.*

The Thirteen-Lined Spermophile inhabits



THIRTEEN-LINED SPERMOPHILE.

about one-third of the United States, extending from Fort Wayne, Indiana, southwestward to Fort Worth, Texas, and northwestward to the plains of the Saskatchewan. Its western limit is the Rocky Mountains, but nowhere does it live in timbered regions, being strictly a prairie animal.

Its burrow is a hole about two inches in diameter, which descends quite steeply into the earth until it passes below the frost line (two to three feet), after which it runs off in a more or less horizontal course for ten or fifteen feet farther. If the burrow is an old one, and much used, it is a long and difficult task to dig to the end of it, and few boys undertake it more than once.

[1] *Ci-tel'lus tri-de'cem-lin-e-a'tus.*

As in the case of nearly all burrowing rodents of cold latitudes, nature has so adjusted the life of this animal that it survives the long and dreary winter in the strange, half-dead condition called *hibernation*. To make this possible, the young are born early in the year, and mature early, and during summer and autumn, take on a great quantity of fat. At the approach of winter, it curls up in its burrow for a sleep of from three to four months' duration.

By the investigations of Dr. P. R. Hoy, it has been discovered that in the case of the Thirteen-Lined Spermophile, the action of the heart is reduced from two hundred to only four feeble beats per minute, the temperature is reduced from 105° to 58°, and there is no visible breathing. The circulation of the blood was so feeble that when a limb was amputated, only a few drops of blood slowly oozed from the wound, while the nerves showed no sensitiveness. In fact, the animal was in a condition of suspended animation, as if under the influence of chloroform. In the northern portions of its range, this spermophile hibernates from about November 20 to April 1.

Franklin's Spermophile[1] looks very much like a slender-bodied, short-tailed tree-squirrel; and very often it is called the *Gray Ground Squirrel*. It should *not*, however, be called the "*Gray Gopher*," or "*Scrub Gopher*," for both these names are erroneous. It is best to call each animal by a name peculiarly its own, even though the beginning of correct naming involves a little trouble.

On an open prairie, especially in spring when the young grass is short, this spermophile is a conspicuous animal, and strongly resembles the gray squirrel of the East. Its upper surface is of a yellowish-gray color marked with fine, wavy, cross-wise lines of black or brown. Its under surface is distinctly gray, and its hair is coarse and stiff. In size it is about 9 + 5 inches. Its home is the central portion of the range of the Thirteen-Lined Spermophile. The western limit follows the eastern boundary of the arid plains northward from southeastern Kansas to the Saskatchewan, Alberta, and from thence southeastward to southern Wisconsin, eastern Illinois and northern Missouri.

Whenever numerous in farming regions, this animal is very troublesome, not only in destroying grain in the ground and in the stack, but also in destroying young chickens. They are very venturesome in locating permanently near farmhouses and barns, and sometimes they are very destructive in gardens. As an offset to the valuable farm products destroyed by these creatures, Franklin's Spermophile destroys great numbers of noxious insects, such as grasshoppers, caterpillars, beetles, and also field mice. In the United States Department of Agriculture, twenty-nine stomachs were examined with the following result: animal matter present, 30.3 per cent.; vegetable, 68.5 per cent., and undetermined, 1.2 per cent. Out of the whole twenty-nine stomachs examined, twenty-six contained the remains of insects! Thus the grain consumed by this animal is at least partially paid for by the destruction of insects that prey upon crops; but farmers everywhere are diligent in destroying it with poisoned wheat placed in its burrow.

RICHARDSON'S SPERMOPHILE.

Richardson's Spermophile,[2] of northern Montana, North Dakota and the region immediately northward as far as the Saskatchewan, has a short body, short legs, and a short tail, and looks very much like a thin prairie-"dog." In color it is like the preceding species, except that its tail is darker; but in size it is a trifle smaller (9 + 3 inches). Its habits are practically identical with those of Franklin's Spermophile, but if there is any difference, it is more destructive to grain than is the latter, and consumes less insect food. It is fortunate that this species inhabits so small an area of the wheat country of the Northwest.

[1] *Ci-tel'lus frank'lin-i.*

[2] *Ci-tel'lus rich'ard-son-i.*

Marmots.

The group of marmots consists of burrowing rodents which in structure are quite squirrel-like, but are distinguished by their large size and general heaviness of body. As befits their portliness of form, they are not active and lively, like squirrels, but live quietly and unobtrusively. By reason of the good sense they manifest in keeping out of mischief, some of them are tolerated in farming communities when more aggressive rodents would be exterminated.

The woodchuck is our most perfect type of Marmot, from which the prairie-"dog," or prairie marmot is slightly removed by the possession of a large and perfect fifth claw. It is desirable, however, that the latter should be included in the group of marmots.

The Prairie-"Dogs."

The Prairie-"Dog"[1] is a plump and sociable little Rodent, not a Carnivore,—well known to every dweller in the plains region of the great

PRAIRIE-"DOGS."

West, and to every trans-continental traveller. His explosive, yapping cry is the most cheerful sound of the western plains. He hates solitude, and always lives in colonies of from 40 to 1,000 individuals. Unlike most other burrowing Rodents, the darkness and silence of a burrow easily pall upon his vivacious nature; therefore he spends the greater portion of his waking hours above ground, visiting his neighbors, and observing what goes on in his small world.

[1] *Cy-no'mys lu-do-vi-ci-an'us.*

When no enemies are in sight, he and his fellow-townsmen roam about for short distances from their homes, and feed upon grass blades and stems. At the approach of an enemy,—man, coyote, badger, fox, gray wolf, eagle or hawk,—the sentry cries out sharply, "*Skip! Skip! Skip!*"

Instantly every "Dog" halts, motionless and alert. If the sentry again cries "Skip!" each "Dog" scurries to his hole, and poises himself over its wide mouth, in readiness for a dive to subterranean safety. If the danger approaches quite near, the alarm cry resounds shrilly from all sides, stubby tails jerk nervously as if worked by wires, and down goes every Prairie-"Dog."

Just how far down the burrows go, it is difficult to say, for they probably vary greatly in depth. The mouth of a burrow is a miniature model of a volcano,—a conical mound of bare earth, a foot high and three or four feet in diameter, with a four-inch crater in the centre, going down at a slight angle. The crater prevents water from running into the burrow.

In making a crater the "Dogs" press the earth into shape on the inside with their noses. Once when an inmate of the Prairie-"Dog" Village in the New York Zoological Park incurred the hostility of four of his mates, they drove him into his burrow, filled up the mouth of it with moist earth, and with their noses tamped it down quite hard, the prisoner scolding vigorously meanwhile.

Prairie-"Dogs" are easily introduced into almost any open country where the ground is dry, but they are very difficult to exterminate. Under fair conditions they breed readily in captivity, and usually produce four young at a birth. In 1899, a free colony was established in the New York Zoological Park in the Antelope Range, where it existed for two years, and its saucy members attracted far more attention than those confined in the fenced village. Knowing that guns and dogs are not allowed in the Park, they often permitted visitors to pass within six feet of them. But it proved impossible to keep those industrious diggers from spreading far beyond the limits fixed for them, and seriously damaging walks and lawns, so they were finally caught by placing sand in boxes over their burrows, and transferred to the village, whose walls of solid masonry go down to bed rock.

Some plainsmen claim that these interesting little creatures are able to locate their towns away from streams because they burrow down until they strike water, but Dr. Merriam points out the fact that in some regions they live where the nearest veins of artesian-well water are 1,000 feet below the surface. As a matter of fact *they can live without drinking.*

The Prairie-"Dog" is at home—where not exterminated by poisoned wheat put into his burrow—from Texas, New Mexico and Arizona northward to the Canadian boundary, and on the western slope of the Rocky Mountains in Utah and Colorado. It is most abundant in Montana, Wyoming and western Kansas. One of the largest Prairie-"Dog" towns yet reported begins in Trego County, Kansas, five miles west of the one-hundredth meridian, and extends along the divide north of the Smoky Hill River, practically without a break, to Colorado, a total distance of about one hundred miles. This town varies in width from half a mile to five miles, and on the top of the divide the nearest water is believed to be 350 feet below the surface. (Arthur B. Baker.)

It is now (1903) reported that because of the wholesale destruction of wolves and foxes, the enormous increase of Prairie-"Dogs" in Kansas, Oklahoma, Texas and Colorado has become a genuine scourge to farmers and cattlemen. The number of "Dogs" in that region is now estimated at several millions, and a general campaign against them has been begun. The method employed for their destruction is a spoonful of poisoned wheat placed in the mouth of each burrow. Beyond doubt, this will soon reduce their numbers to reasonable limits.

When he is not too numerous, I am the friend of the Prairie-"Dog." He is as bright and cheerful as the day is long, and he enlivens many a dreary landscape, but at the same time he often changes fine, grass-covered cattle ranges into dreary wastes, and causes great losses to cattle owners. I hope, however, that he will be tolerated at least to the extent that systematic destruction will stop short of extermination.

It is *not* true that the Prairie-"Dog" lives in peace and harmony in the same burrow with the rattlesnake and burrowing owl. The snakes would make short work of the young Prairie-"Dogs," and the latter would quickly kill the owl! It is safe to surmise that when a deadly and quarrelsome rattler invades the home of a Prairie-"Dog" family, the latter speedily seeks a home elsewhere. The burrowing owl is in the habit of taking refuge in *abandoned* burrows, and nesting in them, to save the labor of digging a burrow for itself. In the Philadelphia Zoological Garden Mr. A. E. Brown once tried the experiment of associating burrowing owls and Prairie-"Dogs." The owls were immediately killed and torn to pieces by the "Dogs."

A Prairie-"Dog" Burrow.

At last a Prairie-"Dog" burrow has been completely exposed by digging, and reported upon in full in one of the publications of the Biological Survey. In the "Yearbook of the Department of Agriculture" for 1901, Dr. C. Hart Merriam publishes a valuable paper on "The Prairie-Dog of the Great Plains," which contains the following illustrated description:

"The holes go down for some distance at a very steep angle and then turn at nearly a right angle and continue horizontally, rising somewhat toward the end. The nests are in side chambers connecting with the horizontal part of the burrow, and usually, if not always, at a somewhat higher level. (See H in figure.) Recently, at Alma, Nebraska, W. H. Osgood dug out a burrow, of which he made a careful diagram, accompanied by measurements.

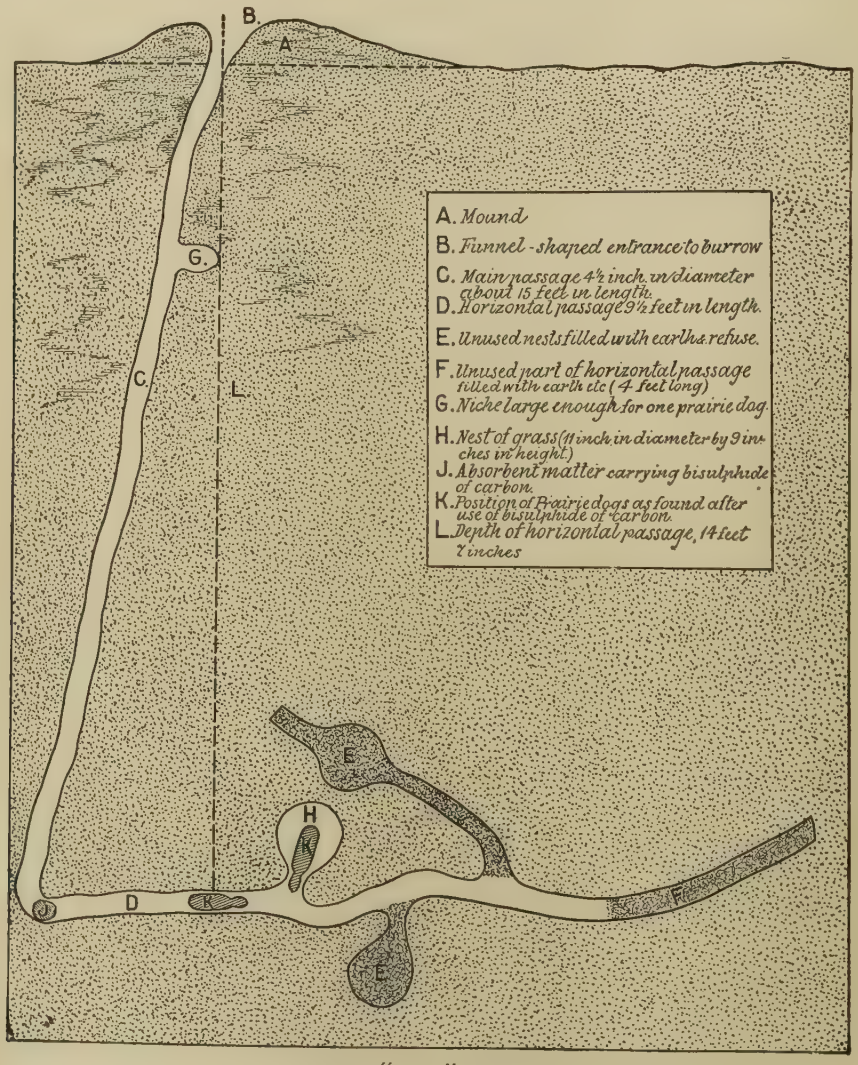
"In this case the burrow went down nearly vertically to a depth of 14½ feet below the surface, when it turned abruptly and became horizontal as shown in the diagram. The horizontal part was 13½ feet in length. One-third of the horizontal part (the terminal 4 feet, F) and two old nests and passageways (E) were plugged with black earth brought in from the surface layer, which was very different from the light-colored clayey earth in which the greater part of the burrow lay.

"Four or five feet below the entrance was a diverticulum, or short side passage (G), probably used as a place in which to turn around when the animals come back to take a look at the intruder before finally disappearing in the bottoms of their burrows. It is also used, apparently, as a resting-place where they bark and scold after retreating from the mouths of the

burrows. As elsewhere noted, they are often heard barking after they have gone in.

"The burrow was opened the day after bisulphide of carbon had been used for destroying the animals, and the material carrying the bisulphide was found at the bottom of the vertical part, just where the horizontal part turns off. Two dead animals were found, one in the horizontal part, the other in the nest, as indicated by the letter K in the diagram.

"The Prairie-Dog has several natural enemies which, when not interfered with by man, usually serve to hold its numbers in check. The most inveterate of these appear to be the coyote, badger, black-footed ferret and rattlesnake."


A. Mound
B. Funnel-shaped entrance to burrow
C. Main passage 4½ inch. in diameter about 15 feet in length
D. Horizontal passage 9½ feet in length.
E. Unused nests filled with earth & refuse.
F. Unused part of horizontal passage filled with earth etc (4 feet long)
G. Niche large enough for one prairie dog.
H. Nest of grass (11 inch in diameter by 9 inches in height.)
J. Absorbent matter carrying bisulphide of carbon.
K. Position of Prairie dogs as found after use of bisulphide of carbon.
L. Depth of horizontal passage, 14 feet 7 inches
B
A
G
C
L
E
H
K
D
J
F
E

PRAIRIE-"DOG" BURROW.

From Dr. C. Hart Merriam, "Yearbook," Department of Agriculture, for 1901.

The Woodchuck, or **Ground-"Hog,"**[1] is tolerated on the farms of New England because he is wise enough to live on clover and other grass, and let the vegetable gardens alone. In the East he is the only representative of the marmots. In form he is short and stout, and his flat head and beady, black eyes give him a surly look. He is not lively and cheerful in his habits, like a

[1] *Mar-mo'ta mo'nax.*

prairie-"dog," and it is seldom that anyone speaks well of him. His favorite home is a burrow in a gravelly hillside in a "swamp lot," or woods pasture, and while he likes to come out and bask in the warm sunshine, he never ventures far from his front door.

In the autumn, instead of storing up vegetables for winter, he takes on a quantity of fat, under his skin. Early in November he blithely goes to sleep in his burrow, and does not waken until February 2,—"Ground-Hog day." Then, —so runs the popular legend,—he emerges, and looks about him. If he sees his shadow, he again retires to his burrow, and sleeps six weeks longer, —which betokens a cold, wintry spring.

The eastern Woodchuck is a typical marmot, short-legged, heavy-bodied, flat-headed, and brownish gray in color. The length of its head and body is 14 inches, and of its tail 5 inches. It inhabits the eastern United States from New York to Georgia, and westward to Kansas and South Dakota.

A much larger species called the **Gray Marmot,**[1] or **Whistler** (22 + 7 inches), is an important northwestern form, strongly marked by its light, grizzly-gray color, with certain dark markings. It is found from the Columbia River northward to about 63° North Latitude and eastward to Hudson Bay. It derives one of its names from the fact that its alarm cry consists of a shrill whistle, which is repeated by the various members of the colony threatened with danger.

WOODCHUCK.

The Yellow-Bellied Marmot,[2] easily distinguished by the bright red hair on its under parts, is a southern species, found in California, Arizona, New Mexico and Texas. High up, on the Olympic Mountains of western Washington, is found still another species of marmot, as large as the

[1] *Mar-mo'ta pru-in-o'sus.*
[2] *Mar-mo'ta flav'i-ven-ter.*

Whistler, which is yellowish in summer, and bluish-gray in winter. This is called the **Olympic Marmot.**

Flying Squirrels.

The Flying Squirrel[1] is a very beautiful little creature, but its strictly nocturnal habits, and strong dislike to daylight, almost rob us of its acquaintance. This is to be regretted, because it is the only native tree-dwelling quadruped which has been provided by Nature with a parachute, consisting of a thin fold of skin stretched between the fore and hind legs, to partly sustain the animal in a long downward flight. Neither the Flying Squirrel, nor the flying lemur of the East Indies, can actually fly; but they leap from a tree-top, go sailing gently downward and outward, and when near the ground curve upward and are carried by their momentum on an ascending plane to the side of an adjoining tree. Anything like horizontal flight is quite out of the question.

THE FLYING SQUIRREL.

[1] *Sci-u-rop'te-rus vo'lans.*

The Flying Squirrel is one of the most exquisite little mammals in North America. Its legs are very delicately formed; its fur is as fine and soft as silk; and when at rest the edge of its flying membrane looks like the edge of a lace ruffle. The head and body (of the eastern species) is about 5 inches long, and the tail 4 inches. These little creatures are quite sociable, and nest in hollow trees, where from five to seven young are born. They come out to play about sunset, and are as sportive as schoolboys playing tag. In captivity they are quite worthless for exhibition, for in the daytime there is nothing to be seen save a small and wholly uninteresting ball of fur.

Three species (and nine subspecies) have been described, and their range covers the eastern United States from Canada to Florida, and westward to Louisiana. On the Pacific Coast, they are found from southern California to Alaska, even to the Mackenzie River basin, but they are not found in the desert regions.

THE SEWELLEL FAMILY.

Aplodontidae.

The Sewellel,[2] **Mountain "Beaver,"** or **Showt'l** of the Indians is a strange and little known animal of the Northwest, with which at least every person in that region should be acquainted. It is reddish-brown in upper color (sometimes grayish-brown), and looks like a tailless woodchuck. It feeds like a beaver, fights fiercely when cornered, is sociable in habit like the prairie-"dog," can climb bushes four feet high, and can burrow and live comfortably either in ground that is low and boggy, or high and dry. Usually it prefers wet ground! A large specimen weighs 4 pounds, measures about 13 inches in length of head and body, and tail a little more than one inch. Strange to say, this once rare animal has recently been discovered inhabiting the grounds of the University of Washington, at Seattle.

THE BEAVER FAMILY.

Castoridae.

The Beaver[3] easily leads the mammals of the world in mechanical and engineering skill, and also in habits of industry. Being chiefly nocturnal in its habits, it sleeps by day, and after nightfall carries on its work unmolested.

[2] *Ap-lo-don'ti-a ru'fa.* [3] *Cas'tor can-a-den'sis.*

AMERICAN BEAVERS AND THEIR WORK.

The dam, and house of sticks in the middle of the pond, are exact reproductions of those works in the Beaver Pond of the New York Zoological Park, as they were at the time this drawing was made.

It is seldom that anyone sees a live Beaver in its haunts during the middle of the day, but it is possible to do so during the hour before sunset. In public zoological gardens and parks, the persistence and success of this animal in avoiding observation is very disappointing to visitors, and exasperating to directors and keepers.

This is the largest gnawing animal in North America. A huge specimen caught in Maine, in 1900, weighed a trifle over 50 pounds. A large one in the New York Zoological Park is 31 inches long, has a tail 12 inches long and weighs 44 pounds.

The American Beaver is still found in a few localities,—but in very small numbers,—from the Rio Grande in Texas throughout the Rocky Mountains, Sierra Nevada and Cascade Mountain regions northward to the limit of trees, and southeastward through Canada to northern New England. The number now remaining in Colorado has been estimated at one thousand.

The Beaver's efforts are directed toward its own preservation and comfort. It builds extensive dams of mud, grass and sticks, in order to create ponds in which it can hide from its enemies, maintain a safe refuge close by the wood on which it feeds, and have an under-water doorway to its house or burrow. More than this, the pond serves as a refrigerator, in the bottom of which the animal stores its supplies of food-wood for winter use, when the surface is frozen for a long period.

Sometimes when food-wood on a beaver pond becomes scarce, the animals dig canals into places where fresh supplies can be cut, and floated down to the pond. These canals are usually about two feet wide.

A Beaver is readily recognized by its very flat, hairless and scaly tail, which beyond the hair of the body is about 9 inches long by 4 inches wide. The tail is never used as a trowel in building dams, but only as a propeller in swimming.

Dam-building is done in two ways. With his front feet the animal digs up soft mud, holds the mass with his fore legs against his breast, and swims with it to the dam. There he deposits it where it is most needed, and pats it down with his front feet. To strengthen the structure, he brings sticks four or five feet long, and one or two inches in diameter, from which he has eaten the bark. These he usually lays upon the dam, crosswise or nearly so, and fills between them with mud.

When Beavers have to build a dam exceeding fifty feet in length, to flood low ground, they usually lay it out with a curve up-stream. The dam built by the Beavers in the New York Zoological Park is about forty feet long, and three feet high, and quite sharply curved up-stream.

In most localities inhabited by Beavers, the banks of the streams are so low that the animals cannot burrow into them, and consequently they build houses for themselves. The ordinary Beaver house is a huge pile of neatly trimmed six-foot poles, with all spaces between the sticks plastered full of mud. The one in the Zoological Park is about fifteen feet in diameter, and five feet high, with a central chamber above high-water-mark, and its only entrance is well under water. If a beaver house is attacked, the occupants immediately seek refuge in deep water.

SKULL OF BEAVER, A TYPICAL RODENT.

The trees which furnish bark most prized by the Beaver as food are the poplar, cottonwood, willow, birch, elm, box-elder and aspen. The bark of the oak, hickory, or ash is not eaten.

The Beaver's front teeth (incisors) are very strong and sharp, and the muscles of the jaw are massive and powerful. It is no uncommon thing for a Beaver to fell a tree a foot in diameter in order to get at its branches. It is said by some observers that large trees are made to fall as the Beavers prefer to have them,—toward their pond. In felling a tree, they first remove the bark from a circle a foot in width, just above

the spur roots, standing on their hind legs while they work. Then, with their huge, chisel-like incisors they cut out chips, circling round the trunk all the while, until only the heart of the trunk remains, and the tree falls.

THE FAMILY OF MICE AND RATS.

Muridae.

When their groups and relationships are fairly understood, the wild mice and rats will be found quite interesting. They are so widely distributed it is very desirable that country-dwellers should know something about them, and appreciate their good points as well as their bad ones. A moderate effort, properly aided and encouraged, will give anyone a fair conception of the grand divisions of this great group; and there the general student can stop, if he so elects.

In approaching this assemblage of North American mammals, the first thought is that its members are difficult to deal with. In some respects they are, but they are by no means as difficult as might be supposed. Like many other new subjects, they yield to a little old-fashioned study. It is not necessary for the general student to enter into the study of a large number of species. Lay the foundation first by becoming acquainted with each genus, and one typical species. Observe the following injunctions:

1. Treat this bit of study with serious attention.

2. Learn first the names of the Families, and the approximate size of each Family.

3. Next learn *by rote*, in regular order, the *common names* of the typical examples given.

4. Learn some of the distinguishing characters of each example.

5. Study the comparative sizes of the various types.

6. Finally, in determining the name of a strange species, *do not feel that you must name it instantly*, or be disgraced! Take time to think over it, and to "look it up." Snap judgments on small creatures have a most annoying habit of proving to be wrong. It is a wise judge who knows when to hand down a decision.

In order to make the genera of North American rats and mice clear to the student, I have procured from Dr. C. Hart Merriam, the highest living authority on these creatures, a fine, perfect, adult specimen of the best known (or most typical) species of each genus. Figures of these skins are here reproduced to show their relative sizes, and a life-like illustration of each of these types is also given. In the text, the most striking distinguishing characters are printed in italics.

With these aids to the text, it should be possible for a clear-headed, keen-eyed student to refer any adult North American rat or mouse to its proper genus. But beware of *young* specimens! Often they are so puzzling that Solomon himself could not place them with any degree of certainty. In determining the species of mice and rats, mammalogists depend largely upon the characters of the teeth; but that is a subject too intricate for the general student.

The table on page 84 shows the various Families of rats and mice, the North American genera, and the typical species of each. It is not necessary for young students to memorize the Latin names of the genera and species; but those who become specially interested in natural history will very soon desire to know them.

The Muskrat,[1] which received its name from its very pronounced musky odor, is the largest native representative of the Mouse and Rat Family. It is readily recognized by its *flat, hairless tail, carried on its edge.* It is of large size, measuring about 21 inches in length. It is of aggressive habit, an admirable diver and swimmer, an industrious and intelligent house-builder, and the only native rat whose fur is valuable. It is found from Labrador and Newfoundland to Alaska, and southward to Arizona and Louisiana.

It is very shrewd in preserving its own life, and even in the large forest parks of New York City, it refuses to be exterminated. When three bogs in the New York Zoological Park were dug out and converted into ponds, the wild Muskrats in the Bronx River found them as soon as they were completed, immediately took possession of them, and there they still remain. Being very destructive to lily bulbs, and most other aquatic plants, their presence in ornamental ponds is very objectionable.

Muskrats are rarely, if ever, found away from ponds or good-sized streams. They are quite as much at home in the water as beavers, and their

[1] *Fiber zibethicus.*

TYPICAL NORTH AMERICAN MICE AND RATS (north of Mexico).

	COMMON NAME OF GENUS.	SCIENTIFIC NAME. GENUS.	TYPE SPECIES.	APPROXIMATE NUMBER OF FULL SPECIES.	SUB-SPECIES
MOUSE AND RAT FAMILY. (*Mu'ri-dae.*)	**Muskrat,**	*Fi'ber,*	*zi-beth'i-cus,*	4	3
	Lemming,	1. *Di-crost'o-nyx,*	*hud-so'ni-us,*	3	5
	Lemming Mouse,	2. *Syn-ap'to-mys,*	*coop'er-i,*	8	1
	Field Mouse,	3. *Mi-crot'us* (*Ar-vic'-o-la*),	*penn-syl-van'i-cus,*	48	18
	Red-Backed Mouse,	4. *E-vot'o-mys,*	*gap'per-i,*	17	5
	Vole,	5. *Phe-nac'o-mys,*	*o-ro'phi-lus,*	7	
	Wood Rat,	6. *Ne-o-to'ma,*	*flor-i-dan'a,*	17	19
	Harvest Mouse,	7. *Reith-ro-don'to-mys,*	*le-cont'i,*	10	6
	Rice-Field Mouse,	8. *O-ryz'o-mys,*	*pa-lus'tris,*	2	3
	Cotton Rat,	9. *Sig'mo-don,*	*his'pi-dus,*	3	5
	White-Footed Mouse,	10. *Per-o-mys'cus,*	*leu-co'pus,*	42	27
	Grasshopper Mouse,	11. *O-ny-cho'mys,*	*leu'co-gas-ter,*	6	6
	Domestic Rat,	*Mus,*	*nor-veg'i-cus,*	4	
THE CHEEK-POUCHED FAMILY OF MICE AND RATS. (*Het-e-ro-my'i-dae.*)	Subfamily of the **Pocket Mice,** (Species small.)	12. *Per-og-na'thus,*	*fas-ci-a'tus,*	26	15
		13. *Mi-cro-dip'o-dops,*	*meg-a-ceph'a-lus,*	1	
	Subfamily of the **Kangaroo Rats,** (Species larger.)	14. *Di-pod'o-mys,*	*mer'ri-am-i,*	5	8
		15. *Per-o-di'pus,*	*rich'ard-son-i,*	9	1
JUMPING MOUSE FAMILY. (*Za-pod'i-dae.*)	**Jumping Mouse,**	16. *Za'pus,*	*hud-so'ni-us,*	10	10
				256	145

habits are strictly aquatic. The tail furnishes the motive power for swimming. The feet are small, and but very slightly webbed, and the body is completely covered with soft, brown fur an inch or more in length, which is much sought by furriers. When taken at the best season, plucked, dressed and dyed a rich brown-black, it is known to the trade as "French seal."

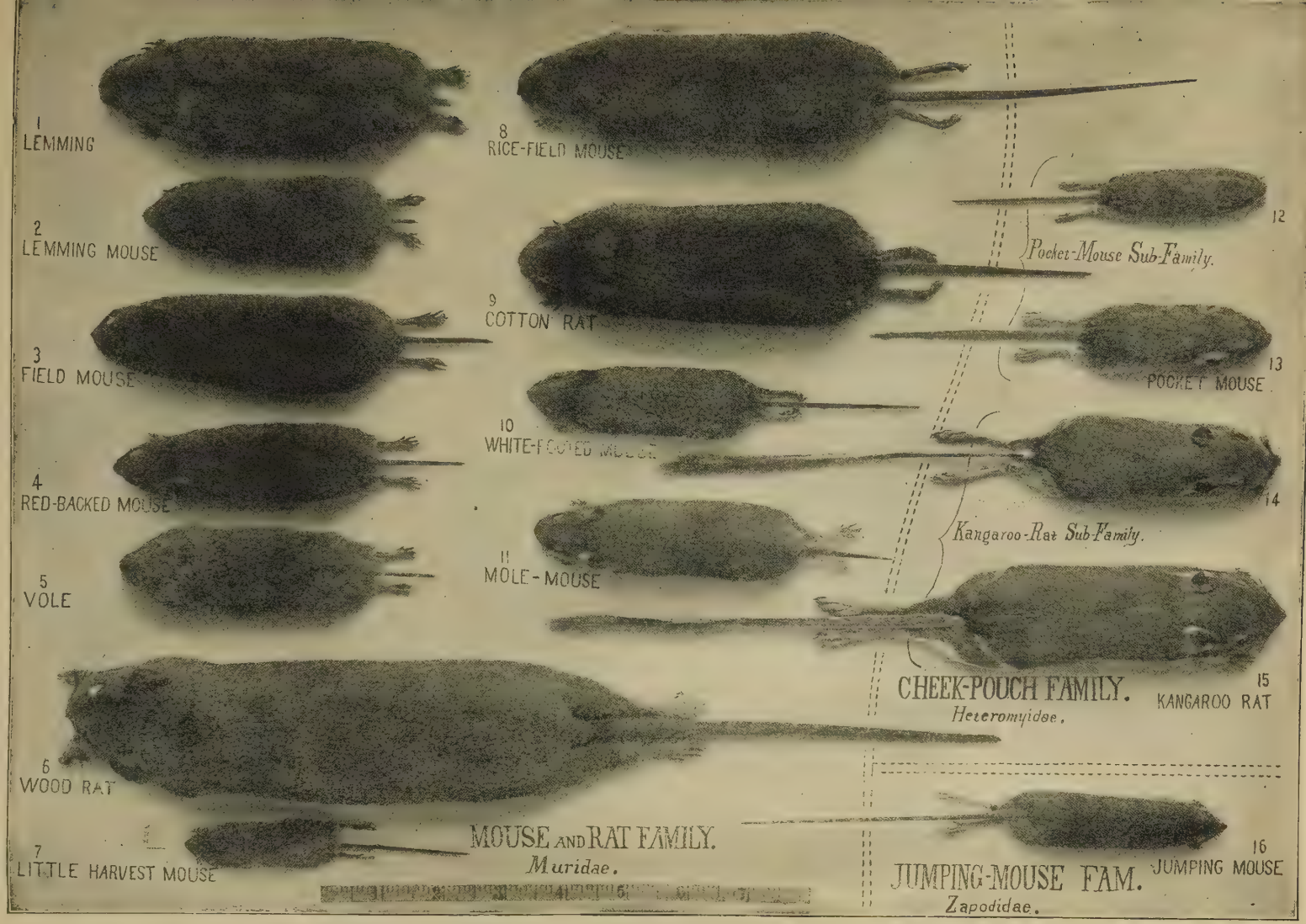
Muskrats that inhabit streams with high banks do not trouble themselves to build houses, but merely burrow into the banks. In rivers and ponds with low margins, however, they gather coarse grass, reeds and mud, and build dome-shaped houses, about five feet in diameter, which rise from two to four feet above the water. All such houses are entered below the surface of the water, so far down that ice does not close their doors, and within there is a floor raised well above the water, on which the inmates eat their food, and sleep.

When too many captive Muskrats are kept in the same enclosure, say twelve in a fenced pool thirty feet square, they fight viciously, and not only kill each other, but sometimes partly devour one of the victims. Although often disputed, it is nevertheless a fact that they eat flesh on very slight provocation. They are very unsatisfactory animals to keep in captivity, no matter what the conditions may be.

The Hudson Bay Lemming[1] is worthy of special notice, because it is the most widely-distributed and noteworthy rat-like animal of the far North. It is strictly a mammal of the cold northland, and like many other arctic animals, its winter coat is pure white, and its fur is dense and warm. Among the west Alaskan Eskimo, skins are very common, and the children delight in using them for doll clothes. (Charles H. Townsend.)

This animal is about the size of a large mole.

[1] *Dicrostonyx hudsonius.*



THE FAMILIES OF NATIVE MICE AND RATS, ILLUSTRATED BY SKINS OF TYPICAL SPECIES.

The scientific names of the above specimens will be found on the opposite page, against the corresponding numbers.

thick-bodied, short-legged, and sharp-nosed. *The ears are extremely short, and quite hidden in the fur;* the legs are short, the feet rat-like, *and the tail is so very short that it also is half hidden by the fur.* The fur is long, fluffy and fine; brown, brownish-gray, or mottled in summer, but snow-white in winter. The length of the head and body is 4 to 5 inches, and of the tail, ½ inch.

The Lemming is found from Latitude 56° northward to the whole arctic coast; in Labrador, Greenland, the arctic islands, and on as far north as man has ever gone on land. It prefers open, dry, moss-covered uplands, and is not found in timbered regions. Often a district of acceptable ground is covered with a wide-spreading network of runways, just below the surface. Mr. C. H. Townsend, who has kept them in captivity, says they are kind-spirited and sociable little creatures, fond of attention, and much given to standing up and hopping about on their hind legs. In summer they store up supplies of vegetable food in their runways for use in winter.

The Lemming Mouse, or **False Lemming,** is interesting chiefly because it is a connecting link between the true lemmings and the mice. *Its ears are very small, and do not rise above the fur on the head.* The type species, known as **Cooper's Lemming Mouse,**[1] is only *two-fifths the size of the Hudson Bay Lemming.* It inhabits the northeastern United States, from Massachusetts to Minnesota, and southward to North Carolina, Tennessee, Indiana and Iowa. Its color above is yellowish-brown washed with black, with bluish-gray or whitish underparts. Length, 3¼ to 4 inches; tail, ¾ inch. Other species of Lemming Mice inhabit Canada, Labrador, New Hampshire, Washington, Kansas and Alaska.

HUDSON BAY LEMMING. Winter and summer pelage.

FIELD MOUSE.

The Field Mouse, or **Meadow Mouse,**[2] stands as a murine monument to scientific endeavor. Since 1798, the genus of this group—long known as *Ar-vic'o-la*—has been described under twenty-four different names, and the type species has received nineteen names besides its own! But, through a century of misnaming in Latin, its original English name, Meadow Mouse, has stood unchanged!

The trouble with this genus seems to have been due to exaggerating the importance of trivial characters, molar teeth and claws. Externally

[1] *Synaptomys cooperi.*
[2] *Microtus pennsylvanicus.*

its species and varieties are so much alike that very few of them can be distinguished from the general mass.

The typical Field Mouse is a *short-eared, short-tailed, thick-set little animal.* It averages 4⅓ inches long, with a tail 1½ inches long. Its color above is reddish-brown, while beneath it is whitish-gray.

It is found from the Atlantic coast to the Dakotas, feeding on roots and grasses.

In severe winters, when the ground remains frozen for a long period, Field Mice are sometimes forced to feed on bark, and frequently kill young fruit trees by barking them near the surface of the snow. When shocks of corn are available these mice live high, literally, feeding well, and being well housed at the same time. In husking shock corn in winter, many a nestful of Field Mice have we helped to turn out into the cold world; but the amount of grain they consumed was so insignificant we never grudged them their food.

Taken as a whole, the Field Mice of various species inhabit nearly the whole of North America north of Mexico and the Gulf, even to the remote islands of Bering Sea. I do not know of a state or province from which they have not been recorded.

The Red-Backed Mouse[1] is, in form, very much like the meadow mouse, but in size it is smaller, and in habit it is quite different. It prefers to live in cool, damp woods and timbered regions, varying all the way from dark swamps and valleys to timbered mountain-tops; but it is seldom found in open country.

They are found from Ontario, New England and New Jersey westward to California, and northward through Canada and Alaska, sixteen species and five subspecies. They are all very much alike, rather slender, and more graceful in form than the field mice, and the majority are reddish-brown above and grayish underneath. The species most common in the eastern United States, often called **Gapper's Field Mouse,** is found westward to the Rocky Mountains. It is 3¾ inches in length of head and body, tail, 1¾ inches. In scientific lists of the mammals of North America, Red-Backed Mice are sometimes called Red-Backed "Voles."

GAPPER'S RED-BACKED MOUSE.

NORTHWESTERN VOLE.

The Voles of the genus *Phe-nac'o-mys,* are small brown mice, mostly of recent discovery, about the size of the red-backed mouse, in color

[1] Until recently this species has been considered identical with *Evotomys rutilus* of the Old World, and has been so called. Now, however, our species is considered quite distinct, and is called *E. gapperi.*

usually dark brown mixed with black. Seven species are known, extending in range from Labrador westward to Oregon, Washington and northern British Columbia, and also down to Colorado. None are found in the eastern half of the United States. There is no special mark by which it is easy to distinguish them from their nearest relatives, the red-backed mice.

The species most widely distributed, and best known, is the **Northwestern Vole,**[1] the largest member of this group,—a grayish-brown creature, with feet and all under parts white, or nearly so. It inhabits Alberta, British Columbia, Idaho, Wyoming, Washington and south central Oregon. Length of head and body, 4 inches, tail, $1\frac{3}{4}$ inches.

In mental capacity the **Wood Rat, Pack Rat, Trading Rat** or **Bushy-Tailed Rat**[2] is the most wonderful member of the whole Rat-and-Mouse Family, at least in North America. The true stories of its pranks are almost beyond belief. Seemingly its chief object in life is to play practical jokes on mankind; and any rat which manifests a spirit of toleration toward man surely is entitled to special consideration.

The typical Wood Rat is a large-sized, big-eyed, large-eared and rather handsome creature,

FLORIDA WOOD RAT.

without the mean, vicious look of a common rat, with fine yellowish-gray fur, white feet, and white under parts. In some species, the tail is covered with long hair, and by this fact alone it is possible to distinguish many members of the genus. The Wood Rats are distributed very generally throughout the southern and western part of the United States, and are also found in British Columbia and Mexico. Frequently their presence is indicated by the huge, mound-like nests, from two to three feet high, which they build of twigs, grass, leaves and bark.

These animals are nocturnal in their habits, and their nest-building and other work is done at night. The most remarkable thing about them is their habit of entering houses and playing practical jokes upon the inmates. A pair of Wood Rats that I knew by reputation at Oak Lodge, in Florida, first carried a lot of watermelon seeds from the ground floor upstairs, and hid them under a pillow. Then they took from the kitchen a tablespoonful of cucumber seeds, and placed them in the pocket of a vest which hung upstairs on a nail. In one night they removed from a box eighty-five pieces of bee-hive fixtures, and hid them in another box, and on the following night they deposited in the first box about two quarts of corn and oats.

Western frontiersmen, and others who live in the land of the Wood Rat, relate stories innumerable of the absurd but industrious doings of these strange creatures. In general they are rather harmless. One of the best known species is the **Florida Wood Rat.**[3] It belongs to the round-tailed group and does not have the hairy, squirrel-like tail of some of the western wood rats. Its upper color is tan mixed with brown, feet and under parts white. The length of the head and body is $8\frac{1}{2}$ inches, tail $6\frac{3}{4}$ inches. Distribution: the southern states from the Carolinas to Texas.

The Little Harvest Mouse looks so much like a small house mouse, $2\frac{1}{2}$ + 2 inches long, that only an expert can readily recognize it at first sight. The ten or more species are scattered throughout the southern, southwestern and Pacific states, but none of them are found in northeastern North America. The usual color is gray-brown above, and lighter underneath, and the best known example is **Le Conte's Harvest Mouse**[4] of the south Atlantic states, from Virginia to Florida.

The Rice-Field Mouse[5] should have been called a rat, for it is 5 inches long, with a five-inch tail. It is strictly a southern animal, in-

[1] *Phenacomys orophilus.* [2] *Neotoma.*
[3] *Neotoma floridana.* [4] *Reithrodontomys lecontii.*
[5] *Oryzomys palustris.*

habiting the wet rice-fields and swamps of the Gulf states from Texas up to southern New Jersey, its northern limit. It has a long head, a sharp nose, a shapely body, prominent ears, and a long tail. Its color above is bleached brown, but its under surface is grayish, or dull white.

This mouse is partial to the vicinity of water, especially the banks of rice-fields. It swims and dives well, and sometimes builds its nest and rears its young in interlaced marsh grass, over water, and far from dry ground.

The Cotton Rat, or **Marsh Rat,**[1] is a species which any country may well be without. It is small for a rat, but courageous, vicious in temper and voracious in appetite. It is fond of flesh, and when several are caged together, the stronger ones do not scruple to kill and eat weaker rats of their own kind. In length it is the size of a large chipmunk, 6 + 4 inches. The upper surface of the body and head, and outside of the legs, are dark mottled yellowish-brown, the under surface and inside of legs dull white, or brownish-gray. Cotton Rats are found from North Carolina to southern Florida, and also in Texas, Oklahoma, New Mexico, Arizona, and Mexico; and wherever found their destructiveness causes them to be cordially disliked.

The White-Footed Mouse, or **Deer Mouse,**[2] is well worthy of acquaintance. It is distributed over nearly the whole of upper North America, except the arctic islands, and the Barren Grounds. On account of the changes it has undergone, chiefly in color shades, and length of tail, naturalists now recognize in the United States and Canada about *seventy species and subspecies!* But the student need not be discouraged by this fact. Every White-Footed Mouse can be recognized by the clean white or light gray color on the under half of its body, head, tail and inner surfaces of the legs, its white feet, and its long tail. The color of the back is usually gray, or brown, or a mixture of the two.

Of all the small mice of North America, I consider this the most beautiful, and one of the most interesting. In the eastern states, where small quadrupeds and birds are numerous, it attracts little attention, but on the western plains, and in the desert regions, where animal life is very

RICE-FIELD MOUSE.

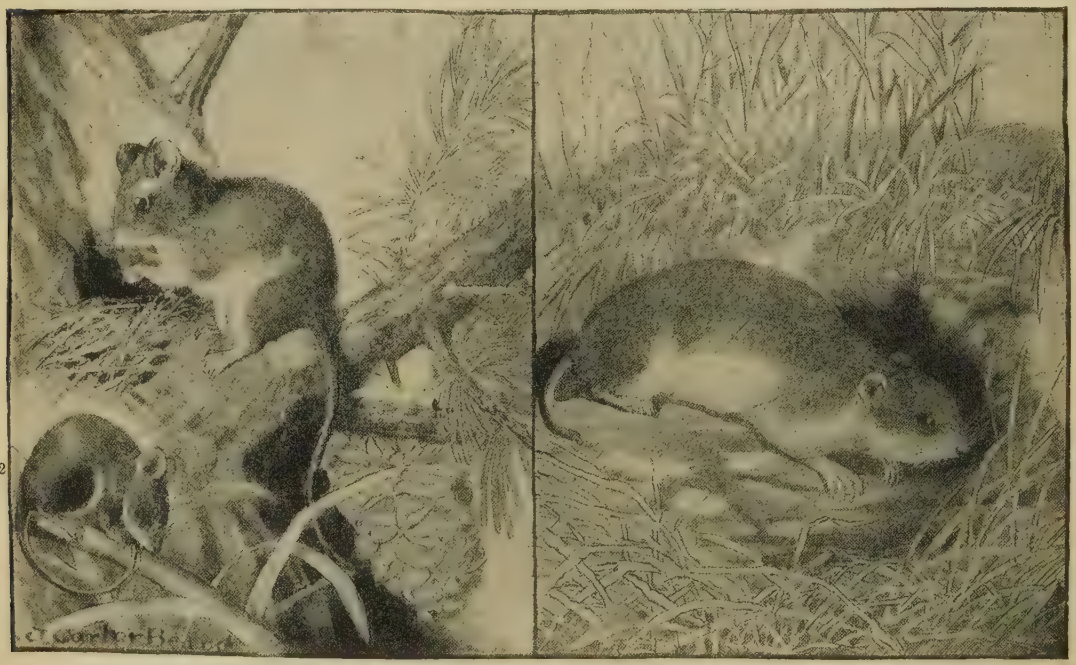
COTTON RAT.

[1] *Sigmodon hispidus.*

[2] *Peromyscus leucopus.*

scarce (and rapidly becoming more so!) these pretty little creatures seem much more worthy of notice. I have many times found them nesting in cavernous and ill-smelling buffalo carcasses, and in the brain cavity or between the jaws of buffalo skulls from which the skin had not been removed by the hide-hunters.

In some places I have lain awake at night to hate mice, for cause, and wish them all dead, by all manner of violent deaths; but on a bleak and wind-shaven Montana plain where the bleaching skulls of thousands of slaughtered buffalo lie



1. WHITE-FOOTED MOUSE. 2. LE CONTE'S HARVEST MOUSE. MOLE MOUSE.

staring heavenward in mute protest against man's inhumanity, an agile White-Footed Mouse, scurrying out of its warm nest of buffalo-hair between the jaws of a buffalo skull, appeals not in vain for my sympathy and protection. Out on the Great Plains the world always seems large enough to contain us both. The great buffalo range of 1883 is now so barren of wild life that to-day even wild mice are objects of interest. From the buffalo to the White-Footed Mouse the time has been less than twenty years.

Many times in their wanderings from one buffalo carcass to another, these mice have travelled over smoothly-shaven prairie divides miles away from all proper shelter. In the West, however, they are found most frequently in the brush and timber of stream valleys, where the rank weeds and grasses produce seed on which they feed. In the eastern United States they are found in nearly all agricultural regions. They are active climbers, possess a wide range of intelligence, and nest in all sorts of places, from ground burrows up to hollows in trees twenty feet from the ground. Of all mice, they are probably the most active climbers, and in fleeing from a disturbed home the mother often carries her brood of young clinging to her body. Their food is seeds, small nuts and acorns, grain, and dried meat when available.

Once in the wilds of Montana, we hauled some old logs to camp, for fire-wood. When one was cut up, we found in it a nest, made chiefly of feathers, containing five White-Footed Mice, snugly housed in the hollow. Packed close against the nest was a pint and a half of fine, clean seed, like radish seed, from some weed of the Pulse Family. While the food-store was being examined, and finally deposited in a pile upon the open ground, near the tent door, the five

mice escaped into the sage-brush. Near by stood an old-fashioned buggy.

Next morning, when the photographer lifted the cushion of his buggy-seat, and opened the top of the shallow box underneath, the five mice, with their heads together in a droll-looking group, looked out at him in surprise and curiosity, without attempting to run away. But very soon it became our turn to be surprised.

We found that those industrious little creatures had gathered up every particle of their nest, and every seed of their winter store, and carried all of it up into the seat of that buggy! The nest had been carefully re-made, and the seed placed closed by, as before. Considering the number of journeys that must have been necessary to carry all those materials over the ground, and climb up to the buggy-seat, the industry and agility of the mice were amazing.

By way of experiment, we again removed the nest, and while the mice once more took to the sage-brush, we collected all the seed, and poured it in a pile upon the ground, as before. During the following night, those indomitable little creatures *again* carried nest and seed back into the buggy-seat, just as before. Then we gathered up the entire family of mice with their nest and seed, and transported them to New York.

The Grasshopper Mouse,[1] originally described by Audubon and Bachman as the **Missouri Mouse,** and often called the **Mole Mouse,** is mentioned in order to caution western observers against confusing it with the preceding species. In some respects it strongly resembles the white-footed mouse, being all white underneath, including its legs. It can readily be distinguished by its large fore claws and its *short, stumpy tail,* which is only about one-third as long as the head and body. Its upper surface is brownish-gray. *Its fur is very fine and soft,* and hence it is sometimes called the Mole Mouse. Its length, head and body, is $4\frac{1}{2}$ inches, tail, $1\frac{3}{4}$ inches.

CHEEK-POUCH MICE AND RATS.

Heteromyidae.

This is strictly a Family of the West and Southwest, its members being found only west of Arkansas, Iowa and Minnesota. It does *not* contain the pocket gophers. Many of its twenty-six species are desert dwellers, even inhabiting Death Valley, California. All its members are distinguished from other North American animals (except the jumping mouse and pocket gopher) by the presence of a large and very serviceable hair-lined pouch in the skin of each cheek. Barring the two exceptions noted, this character alone is sufficient for the recognition of any American member of this Family.

As clearly shown in the full-page diagram, this family may be divided into two Subfamilies, an arrangement which is very convenient and helpful. The first we must call the **Pocket Mouse** Subfamily and its leading genus (*Per-og-na'thus*) contains twenty-six full species, and fifteen subspecies. All are distinguished by the following characters: head large; body slender and graceful; *hind legs long, and fitted for jumping; tail long; large external cheek pouches, hairy inside, and not connected with the interior* of the mouth; hair smooth and compact, sometimes intermingled with spines. These mice are quick and active in movement, and some species leap with considerable power.

KANGAROO RAT.
Showing the very large cheek-pouches.

Since 1839 the **Typical Pocket Mouse**[2] has been described again and again, but none of its describers have taken the trouble to give it an English name! Hereafter, let us call it by the name given above, because it is the type of its genus. It inhabits Montana, Wyoming and the Dakotas. Its color above is sandy-yellowish, lined with black; underneath, white; and these two color areas are divided low down along the side by a lengthwise band of pale yellow. Length, $3 + 2\frac{3}{8}$ inches.

The Kangaroo Rat[3] Subfamily, of fifteen full species, is fitly represented by an elf-like creature which is one of the most beautiful and at-

[1] *Onychomys leucogaster.*

[2] *Perognathus fasciatus.*

[3] Typical species, *Perodipus richardsoni* of western Kansas, Oklahoma and Indian Territory.

tractive of all our native rats. In the dry and sterile regions of the great Southwest, from the Indian Territory to Arizona and California, where seemingly the deserts produce nothing but sand, cacti, yuccas and sage-brush, these pert little creatures hold forth. Apparently they are both fire-proof and water-proof, for no amount of heat affects them, and the absence of water does not seem to depress their spirits in the least. Like most mice and rats, they are nocturnal. Some of the species build for themselves large mounds of dirt and gravel, from one to three feet high and five to ten feet in diameter, which are honeycombed with burrows

1. AND 2, KANGAROO RAT.
3. TYPICAL POCKET MOUSE.

and runways. These dwellings are often inhabited by rattlesnakes and lizards, and doubtless the Kangaroo Rat is an important item of food in the diet of the desert rattler.

The Kangaroo Rat is very unlike the members of the Mouse-and-Rat Family; and in temper no creature could be more unlike the domestic rat. Unlike most mice and rats, they do not bite when handled, but they are so delicate that they do not live long in captivity, unless tended with extreme care and intelligence. They stand high on their hind legs, like pigmy kangaroos, and hop about with their front paws tucked up close under the chin, almost hidden by their fur. The tail is very long, has a showy tuft of long hair on the end, and is used by the animal in balancing itself when in motion. The fur is soft, silky, rather long, and of a tawny-brown color above. Length of head and body, 4½ inches, tail, 5¾ inches. The cheek-pouches are large, and are of great use in carrying sand out of burrows.

JUMPING MOUSE FAMILY.

Zapodidae.

The Jumping Mouse[1] is one of the most remarkable of all our small animals. In form it is a *slender-bodied mouse*, with *an exceedingly long tail, kangaroo-like hind legs, and cheek-pouches.* Its average length of head and body is about 3 inches, and tail 5 inches. In color it is dark reddish-brown above, white underneath, with smooth compact hair. Although no larger than a house mouse, it can jump from eight to ten feet.

When a farmer boy is hauling in sheaves of wheat, and a small animal suddenly makes a tremendous flying leap from the bottom of the shock, he may know that he has disturbed a Jumping Mouse, and the chances are that he cannot capture it by hand. In these long jumps —perhaps the longest on record for an animal of equal size—the tail is as necessary as a stick is to a sky-rocket, to enable the little creature to preserve its balance, and go straight ahead. If the tail is cut off, the Jumping Mouse turns over and over in the air, and perhaps lands upon its back.

The Jumping Mouse is quite nocturnal in its habits, and is seldom seen in the daytime. It feeds on seeds and grain, and while it devours great quantities of weed seeds, it inflicts upon the farmer no damage worthy of mention. In the autumn it stores in the ground quantities of food for winter use, but despite this fact, under certain conditions it becomes so thoroughly dormant in winter that it seems to be quite lifeless. It is found throughout the northern United States and Canada, in wooded regions, from New York to California, and as far north as Lake Nushagak, Alaska.

Opinions Regarding Rats and Rat-like Animals.

The largest rat-like animal in America is the **Coy'pu Rat,**[2] of Central and South America, which stands 9 inches high at the shoulders, attains a length of 19 inches head and body, tail,

[1] *Zapus hudsonius.* [2] *My-o-cas'-tor coy'pus.*

13 inches, and weighs 8 pounds. It is a water-loving animal, almost as much so as the musk-rat, and its thick, brown fur is valuable. Under proper conditions it is easily kept in captivity.

The smallest rodent in America is the **Least Pocket Mouse,**[1] of the Rocky Mountain region, which has a total length of head and body, $1\frac{7}{8}$ inches; tail, $2\frac{3}{4}$ inches.

The best swimmer of all rat-like animals is the **Muskrat.**[2]

The best climber is the **Tree Rat,**[3] of southern India.

The handsomest rat or mouse in the New World is the **Kangaroo Rat,** of the southwestern United States, figured on the opposite page.

The most humorous of all rat-like animals is the **Trading Rat,** described on page 89, which delights in playing practical jokes upon its human neighbors.

The meanest of all rodents is the brown-coated **Domestic Rat,** the pest of civilization everywhere, which was sent to man as a perpetual punishment for his crimes against harmless wild creatures all over the world.

THE POCKET GOPHER FAMILY.

Geomyidae.

The Red Pocket Gopher[4] is the most important representative of a large Family of burrowing rodents which does great damage to the crops and lands of American farmers. Whenever you see a brown-coated burrowing animal, the length of a small rat, but twice as thick, with a big pouch in the skin of each cheek, a swinish appetite, a set of long claws like burglar's tools on each fore foot and a most villanous countenance and temper, you may know that it is a Pocket Gopher. The pockets in his cheeks are to enable him to carry extra large quantities of stolen potatoes and seeds. When once you have learned the true character and habits of this creature, you will, without being asked, carefully refrain from calling any ground-squirrel a "Gopher."

Most wild animals have some redeeming qualities, but this cannot make good a claim to one. Gophers are not only thieves and robbers, but they are so ill-tempered that they even hate each other, and the old ones usually are found living alone. When two captives are placed together, they usually fight fiercely until one is killed. Their teeth and front claws are very powerful, and working together they do great damage, in many different ways.

As a Family, Pocket Gophers inhabit the whole United States west of Indiana and the lower Mississippi, and also a large part of Alabama,

JUMPING MOUSE.

Georgia and Florida. Three genera and about thirty-three species are recognized, and while some are smaller than others, and some are gray or black instead of brown, their appetites and habits are all equally objectionable. They spoil meadows by throwing up innumerable hillocks of loose earth; they devour great quantities of vegetable crops, and also corn and small grain; they eat the roots of young fruit-trees of nearly all kinds, and they destroy canals and irrigating ditches by honeycombing their banks. With incisor teeth that in sharpness and strength are like steel chisels, a Gopher can pare off all the roots from a young tree quite as neatly as a man pares potatoes.

Our type species, the Red Pocket Gopher "is," says Mr. Vernon Bailey, "of much greater economic importance than all the other species combined, for the reason that its home is in the fertile prairie region of the Mississippi valley,'

[1] *Per-og-nath'us fla'vus.* [2] *Fi'ber zi-beth'i-cus.*
[3] *Mus ru-jes'cens.* [4] *Ge'o-mys bur-sa'ri-us.*

embracing Iowa,—which is its centre of distribution,—Illinois, Missouri, Wisconsin, Minnesota, and the eastern parts of the Dakotas, Nebraska and Kansas. Its length is about $7\frac{1}{2} + 3$ inches. The young are either two or three in number, and there is only one litter each year.

The enemies of the Gopher are the weasel and the gopher snake.[1] Because of the damage done by Gophers, farmers generally wage war upon them with traps, strychnine, and poisoned grain. In Iowa, Minnesota and other states, many thousands of dollars have been paid out by county treasurers in bounties on Gopher scalps and tails. No animal in the West is more universally disliked, nor more diligently destroyed.

My acquaintance with the Gopher Family began when I was a farmer boy, in Iowa, the storm centre of *Ge'o-mys bur-sa'ri-us*. Having

RED POCKET GOPHER.

trapped a few, I made the mistake of supposing that I knew more about the habits of those creatures than did my elders, who had not. In an evil moment, I announced that any strong boy could catch a Gopher by digging it out of its burrow, and my large brother offered me twenty-five cents if I could prove that claim within a week.

That evening, with mattock and spade, I repaired to my father's corn-field, into which strange Gophers were rapidly migrating and settling; and finding a fresh hole with the owner inside, I began to dig. My shepherd dog, Rover, assisted me all he could, chiefly by keeping me company, but also by digging when I rested.

We dug into the twilight, and later on we dug into the night; but the Gopher kept well ahead of us. Whenever we paused to listen, we could hear him digging hard, and to our dismay we found that he knew a thing or two about getting on in the world. With the descent of black darkness, our hopes of overtaking that Gopher descended also; and then pride, not hope of reward, was all that spurred us on. *Would* we have to give up beaten, by an ugly, pig-eyed old Gopher?

When for about the thirtieth time I paused to wipe the accumulation of perspiration and prairie loam from my brow, Rover suddenly rushed off into the darkness. In the corn-rows thirty yards away, he seized something, shook it vigorously, and a moment later came trotting back to me, carrying in his mouth a large Gopher! The beast had been migrating into the corn-field, and Rover simply caught him on the fly.

Digging operations ceased abruptly at that point. Thanking Rover for his timely assistance, I accepted his contribution, and we marched home together. When I exhibited to my brother the Gopher that we had secured "by digging," he was profoundly surprised, but promptly paid the money. Rover looked on smilingly, and said not a word; but we both knew then that in catching Gophers, steel traps are better than spades.

THE PORCUPINE FAMILY.

Erethizontidae.

The Porcupine is at home either in tree-tops or on the ground, but it is always a slow-moving and dull-witted animal. It is easily captured or killed by man, but not so readily overcome by wild animals. In the woods, it loves to prowl around camps, and eat every scrap of leather or greasy board that it can find. It is fond of the bark of hemlock, beech and cottonwood, and often a Porcupine will remain in a good tree until he entirely strips it of its bark.

The Canada Porcupine,[2] which is black, with a gray-tipped storm-coat, is found in New England, New York, Pennsylvania, Ohio and thence northward and northwestward to Fort Churchill on Hudson Bay. The West and Northwest is the home of another species, known as the **Yellow-Haired Porcupine.**[3] Large specimens weigh from 25 to 30 pounds. The flesh is not palatable to white men, but is eaten by Indians.

The Canada Porcupine *never* should be called

[1] *Pituophis.*

[2] *Er-e-thi'zon dor-sa'tus.* [3] *E. ep-i-xan'thus.*

a "Hedgehog," because the latter is not a gnawing animal, but a small, weak, insect-eater, which does not inhabit America. A full-grown Porcupine is about twenty times as large as the common European hedgehog.

Porcupines can *not* shoot their quills, not even for one inch; and the idea that they can—or ever have—is entirely erroneous. When attacked, their defence consists in erecting their quills, and striking quickly a strong sidewise blow with the tail, which often drives many quills into its enemy. Strange to say, wild animals are about as lacking in original information, or "instinct," regarding this creature as dogs are. Several pumas and lynxes have been killed in a starving condition, with their mouths and throats so filled with porcupine quills that eating had become almost impossible.

THE PIKA FAMILY.

Ochotonidae.

The Pika, commonly called the **Little Chief "Hare,"** or **Crying "Hare,"**[1] looks very much like a small, gray-brown rabbit, 7 inches long; but it is neither a rabbit nor a hare, and represents an independent Family. It lives high up on the great mountain ranges of the West, from just below timber line up to the line of perpetual snow. It finds shelter in the crevices of rugged masses of rock, and its sharp little cries often seem to come from so many different points that the hunter is completely confused. In form this strange little creature is about half way between a gray rabbit and a guinea-pig; and it has neither speed nor activity.

THE HARE AND RABBIT FAMILY.

Leporidae.

This group is very clearly subdivided and there need be no confusion of ideas regarding its North American members. Nevertheless, early writers have made a confusing error in the improper adoption, for one important group, of the misleading name Jack "Rabbit." It should be Jack *Hare.*

All the American members of this Family are separated into two general groups, the *Hares* and the *Rabbits.* The accompanying diagram shows these subdivisions, and their relations to each other.

[1] *O-cho-to'na prin'ceps.*

A typical **Hare** is *big, long-eared, long-legged,* and a swift runner. Very often its color changes according to the season. It does not burrow, but rears its young in a nest or "form."

The **Rabbit** is *small, short-eared, short-legged,* a weak runner for a long distance, its color is fairly constant, and it lives in a burrow.

The **Varying Hare Group** is the key to the entire Family; or, in other words, it stands on middle ground between the Rabbits, the Polar Hare, and the Jack Hare, and is related to all three. Naturally this group should be studied

SANBORN, Photo., N. Y. Zoological Park.

CANADA PORCUPINE.

first. Its type species is the **Northern Varying Hare,**[2] of northern New York, New England, Canada and the Northwest Territories. Its name is due to the fact that its color varies according to the season, being *pale cinnamon brown in summer,* and *white in winter,* with only a narrow back line of brown.

It is nearly twice as large as the cotton-tail rabbit, but its ears and legs are about half way in proportionate length between those of the

[2] *Le'pus a-mer-i-can'us.*

common rabbit, and the jack hare of the Southwest. Large male specimens measure 18 inches in length of head and body, tail, 2 inches, and weigh 6 pounds.

Like the true fur-bearing animals, Varying Hares have two kinds of fur,—a dense, fine and soft under fur through which grows a storm-coat of thin, coarse, straight hair. It is the latter which gives an animal its color. In the summer these long hairs are black, but as winter approaches they turn white.

The habits of the Varying Hares and Rabbits are so nearly the same that it is unnecessary to describe them separately. They all require brushy ground, broken rocks, rugged ravines or tree-holes in which to hide from the foxes, dogs, men, mink, martens, lynxes, skunks and birds of prey which constantly hunt them as food. But for their keenness of sight, hearing and scent, their swiftness in running to cover, and their marvellous agility in doubling and turning when pursued, their numerous enemies would soon exterminate them.

The Polar Hare[1] is the most northern species of this Family. Colonel Brainard found its tracks at 83° 24′, which for fifteen years remained man's "farthest North." In the southern portion of its home, this hare is gray and white in summer, but in the higher polar regions it is white all the year round, like the majority of true arctic animals,—the owl, fox, bear and wolf.

The Prairie Hare[2] of the western plains is generally supposed to be of the same species as the so-called jack "rabbit" of the Southwest; but it is not. In form, size and color, it may be considered a connecting link between the varying hare group and the jack hare group, and its separate identity should be remembered. Its home is the great sage-brush plains of the Northwest, from Kansas to the Saskatchewan, and westward to Oregon, and northern California. It is gray in summer, but changes to white in winter. It is a large species (23 inches long), with ears longer than its head, long, strong hind legs, and a white tail unmarked with black, a character by which it can be readily distinguished from other jack "rabbits."

On the treeless plains of the great West, where it is often seen without any other objects to furnish comparisons, it sometimes seems of immense size, and a Prairie Hare 200 yards away has often been mistaken for an antelope supposed to be 600 yards distant.

The Jack Hare[3] (commonly called **Jack "Rabbit"**) is easily recognized by his extremely large ears,—five to six inches long,—slender body, long legs and athletic build, and the black mark on the upper surface of the tail. There are seven species, all very much alike, which inhabit the southwestern quarter of the United States, extend northward to Oregon, eastward to Nebraska and Kansas and southward to Tehuantepec, Mexico. In many localities wherein wolves and foxes have been exterminated, these hares have multiplied until they have become a great pest. In several localities in California, and also in eastern Colorado, great rabbit-drives are made, in which many thousand Jacks are slaughtered, and given away in large cities for food.

The Jack Hare is a very swift runner. In eastern Kansas, Professor L. L. Dyche once saw a good greyhound chase a Jack on fair ground for about two and a half miles, and in the whole distance the hound gained only about twenty-five yards. The hare finally escaped by running into *a hollow log* that had been left on the prairie by accident, and was the only shelter within five miles!

The Gray Rabbit, or **Cotton-Tail,**[4] is a typical representative of the Rabbit Family, which contains twelve species. Throughout the extensive region which forms its home,—from New England and Minnesota to Yucatan,—it refuses to be exterminated, and is perhaps more frequently seen and more widely known than any other quadruped.

All the true rabbits are small, and for long running their legs are short and weak; but what they lack in endurance they make up in cunning and quickness. To aid in their preservation, Nature has given them colors that blend so perfectly with their surroundings that a rabbit crouching low often is compelled to run to avoid being trodden upon. When hard pressed for a nesting place in a city, a Gray Rabbit has been known to dig a shallow hole in the smooth lawn of the Smithsonian grounds at Washington, line it with her own fur, and *rear her young in it,* within forty feet of the National Museum building, and a busy roadway, without discovery by

[1] *Lepus arc'ti-cus.* [2] *Lepus cam-pes'tris.* [3] *Lepus tex-i-an'us.* [4] *Lepus syl-vat'i-cus.*

POLAR HARE GROUP.
LARGE. EARS SHORTER THAN HEAD: PELAGE PURE WHITE, OR BUT SLIGHTLY COLORED IN SUMMER.
ARCTIC REGIONS.
6 SPECIES.
POLAR HARE
(LEPUS ARTICUS)
LARGE: WHITE IN WINTER AND GRAY OR BROWN IN SUMMER: EARS AS LONG AS THE HEAD: LEGS MODERATELY LONG.
VARYING HARE, (LEPUS AMERICANUS).
VARYING HARE GROUP.
NORTHERN UNITED STATES AND CANADA.
4 SPECIES.
RABBIT GROUP.
SMALL: COLORS CONSTANT; NEVER WHITE: LEGS SHORT WEAK RUNNERS. EARS SHORT.
UNITED STATES GENERALLY, MEXICO, AND SOUTH TO COSTA RICA.
12 SPECIES
COTTON-TAIL RABBIT, (LEPUS SYLVATICUS)
PRAIRIE HARE.
PRAIRIE HARE,
(LEPUS CAMPESTRIS)
LARGE: EARS LONGER THAN HEAD: HIND LEGS LONG AND STRONG: COLOR VARIABLE.
N:W UNITED STATES.
JACK HARE
(OR JACK "RABBIT") GROUP.
LARGE: SLENDER; LEGS LONG AND STRONG: SWIFT. EARS VERY LONG AND LARGE COLORS CONSTANT.
S:W. UNITED STATES, PACIFIC STATES & MEXICO.
7 SPECIES.
JACK "RABBIT".
(LEPUS CALLOTIS).

DIAGRAM OF THE

HARE AND RABBIT FAMILY

IN NORTH AMERICA,

SHOWING THE RELATIONSHIPS AND COMPARATIVE SIZES OF THE FIVE GROUPS.

Copyright 1903 by W. T. Hornaday

dogs or men until the mowers found the nest almost under their feet. Every year one or two pair breed in the adjoining grounds of the Department of Agriculture.

When a rabbit can have his choice of hiding-places, he chooses a burrow directly beneath a large tree, the roots of which render it difficult, or it may be impossible, for man or beast to dig him out. Crevices in rock ledges are equally good, but he often finds that hollow logs, hollow trees, and brush piles only lead to swift destruction.

He never sleeps in daylight, when enemies are afoot. If the Man-With-a-Gun approaches, he crouches low and lies as still as a stuffed rabbit, breathing seldom, winking never, but with legs all ready to spring. His keen eyes and ears measure every yard of his enemy's approach, until the dead line is crossed when—Zip! Out flashes a long, gray streak,—flying over logs, and darting through openings so swiftly that in two or three seconds a snow-white signal flag waves an adieu, and disappears.

In summer hares and rabbits feed on green twigs, soft bark, buds, grass, leaves and berries. In winter they are forced to subsist chiefly on the bark of bushes and the berries of the wild rose. Whenever they gnaw the bark from young fruit-trees, it is a sign that they are hard pressed for food.

Rabbits breed very rapidly, often raising three litters a year, and if not kept in check by birds of prey and carnivorous animals, would soon become altogether too numerous. In Australia and New Zealand, the rabbits "introduced"[1] from Europe have multiplied until they have become a fearful scourge, and are now so numerous it is impossible even to keep them in check. Possibly the use of their flesh as food, and their skins as "fur," may lead to an abatement of the evil. The moral of the rabbit in Australia, the mongoose in the West Indies, and the English sparrow in America, is, before "introducing" a foreign species of bird or mammal into America, take expert advice,—and then don't do it! This refers to species able to live wholly by their own efforts when imported and set free.

THE DISAPPEARANCE OF THE "BIG GAME" FROM THE UNITED STATES.

The "Game Laws of the United States," as annually published by the United States Department of Agriculture, furnish the most clear and indisputable proof of the progressive disappearance of big game from the United States, and the extinction in our land of hunting with the rifle. While it is true that about one-third of this is due to agriculture and settlements, the other two-thirds is due to lack of foresight, lack of courage, mismanagement of the game supply, and also much wickedly wasteful slaughter. Even to-day (1927), the areas of wilderness and forests in the United States are, in the aggregate, *immense;* and in those areas there is no excuse for the extinction of so much game that the extinction of sport has followed as it has. The following is a brief summary of the consequences of our "American system of big-game protection," up to 1927:

The Arizona elk and California grizzly bear species are totally extinct. As a United States *wild* animal the American bison hangs on by a slender thread of 125 well-protected animals in the Yellowstone Park. Once hunted in thirty-two states, the prong-horned antelope now is not to be hunted in any state, nor in Mexico or Canada. Once hunted in seven states, the woodland caribou, as killable game, has vanished. The moose once was hunted in eleven states, now in but one only. The elk once inhabited thirty-two states. Now it is hunted in three states only.

The universal white-tailed deer has, to a surprising degree, stubbornly resisted extermination; and in California the same is true of the Columbian black-tail. The former will be the last big-game species of the United States to become totally extinct. The fine mule-deer species is far along on the road to oblivion. The mountain sheep of several species once inhabited fourteen states; but now only one of them permits sheep hunting.

Speaking generally, big-game hunting in the United States now is down to white-tailed deer, Columbian black-tail in California, elk in three states, a rare and widely occasional black bear, rabbits, and squirrels.

[1] A species transplanted from one country to another is said to be "introduced."

CHAPTER VIII

THE ORDER OF HOOFED ANIMALS

UNGULATA

The Order which includes the hoofed animals of the world is called Un-gu-la'ta, a Latin word which means "hoofed." In North America, it is represented by a great variety of forms, several of which are of special importance.

Before seeking to become acquainted with these animals, the student must pause long enough to gain a bird's-eye view of the groups into which they are divided, and thereby understand their relationships, clearly and correctly.

The following diagram of arrangement is very simple, and the animals it sets forth are in some respects the most important in America.

THE GROUPS OF NORTH AMERICAN HOOFED ANIMALS.

	FAMILIES.	GROUPS.	EXAMPLES.	
ORDER UNGULATA. HOOFED ANIMALS (Of North America only).	CATTLE AND SHEEP FAMILY, *or BOVIDAE:*	*Cattle:*	**American Bison : Buffalo,**	*Bos americanus.*
		Sheep-Cattle :	**Musk-Ox,**	*Ovibos moschatus.*
		Sheep :	**Big-Horn,**	*Ovis canadensis.*
			White Sheep,	*Ovis dalli.*
			Black Sheep,	*Ovis stonei.*
		Goat : .	**Mountain Goat,**	*Oreamnos montanus.*
	ANTELOPE FAMILY, *or ANTILOCAPRIDAE:*	. . .	**Prong-Horned Antelope,**	*Antilocapra americana.*
	DEER FAMILY, *or CERVIDAE:*	*Round-Horned Groups :*	**Elk,** or **Wapiti,**	*Cervus canadensis.*
			White-Tailed Deer,	*Odocoileus virginianus.*
			Mule Deer,	*Odocoileus hemionus.*
			Black-Tailed Deer,	*Odocoileus columbianus.*
		Flat-Horned Groups :	**Barren-Ground Caribou,**	*Rangifer arcticus.*
			Woodland Caribou,	*Rangifer caribou.*
			Moose,	*Alces americanus.*
	PECCARY FAMILY, *or TAYASSUIDAE:*	. . .	**Collared Peccary,**	*Tayassu tajacu.*
	TAPIR FAMILY, *or TAPIRIDAE:*	. . .	**Baird's Tapir,**	*Tapirella bairdi.*

THE CATTLE AND SHEEP FAMILY.

Bo'vi-dae.

General Characters.—The Cattle Family of the world contains a grand array of large animals, such as the wild cattle, bison, buffalo, musk-ox, mountain sheep, ibex, and wild goats. There are about fifty species in all, scattered over all continents save South America and Australia. All the members of this Family have divided hoofs, and simple horns (i.e., not branching) consisting of a hollow sheath growing over

a pointed core of very porous bone. The horns grow until the animal reaches old age, and are never shed. If knocked off by accident, the new horn material presently covers the horn core, but never succeeds in forming a perfect weapon like the original. Such a growth is called a "crumpled" horn. The members of this Family eat vegetable food, preferably grass and herbage, and have no upper front teeth.

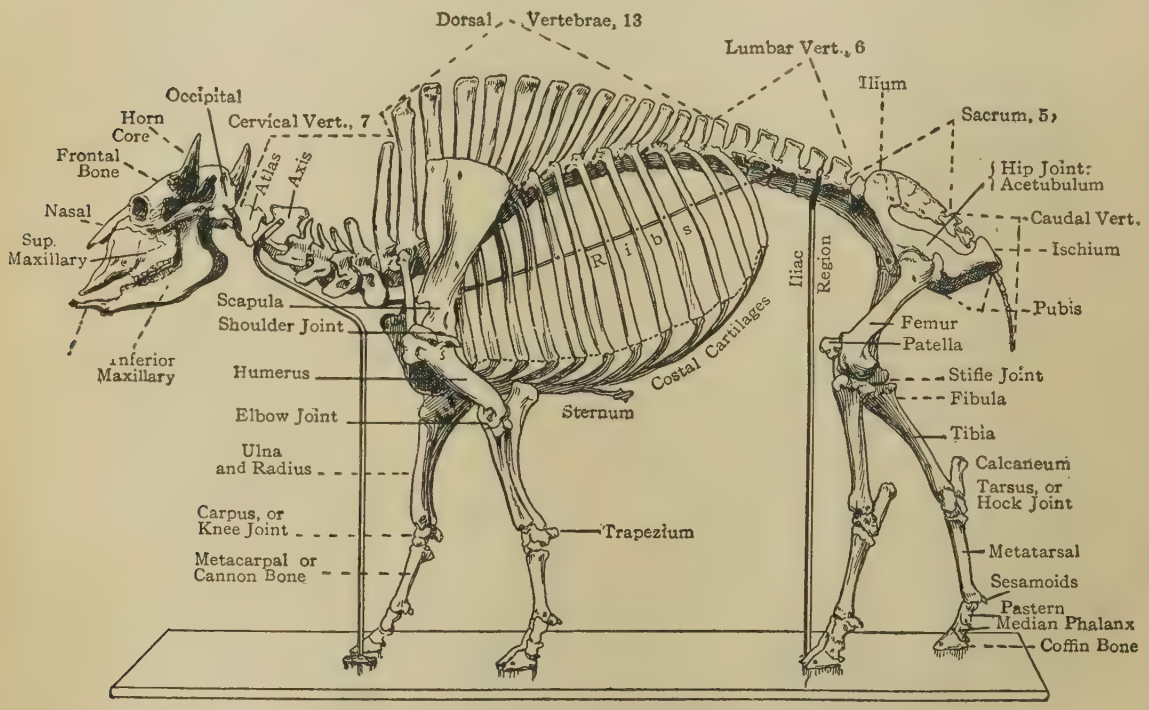
The American Buffalo.

The American Bison or Buffalo.—A true "Buffalo" is an animal with *no hump* on its shoulders; and is found only in Africa and Asia. Our animal, having a high hump, is really a *Bison;* but inasmuch as it is known to millions of Americans as the "Buffalo," it would be quite useless to attempt to bring about a universal change in its popular name.

Because of its great size, imposing appearance, former abundance and value to mankind, this is the most celebrated of all American hoofed animals. Its practical extermination in a wild state is now a source of universal regret.

The Buffalo was first seen by white men in Anahuac, the Aztec capital of Mexico, in 1521, when Cortez and his men paid their first visit to the menagerie of King Montezuma. In its wild state it was first seen in southern Texas, in 1530, by a shipwrecked Spanish sailor. The Buffalo once roamed over fully one-third of the entire continent of North America, and its numbers far exceeded those of any other large mammal of recent times.

Not only did it inhabit the plains of the West, but also the hilly hard-wood forests of the Appalachian region, the northern plains of Mexico,



SKELETON OF AN ADULT MALE AMERICAN BISON.

the "Great American Desert," the Rocky Mountain parks on the continental divide to an elevation of 11,000 feet, and the bleak and barren plains of western Canada, up to the land of the musk-ox. From north to south it ranged 3,600 miles, and from east to west about 2,000 miles.

It is safe to say that no man ever saw in one day a greater panorama of animal life than that unrolled before Colonel R. I. Dodge, in May, 1871, when he drove for twenty-five miles along the Arkansas River, through an unbroken herd

of Buffaloes. By my calculation, he actually saw on that memorable day nearly half a million head. It was the great southern herd, on its annual spring migration northward, and it must have contained a total of about three and one-half million animals. At that date, the northern herd contained about one and one-half millions.

Railway led to a grand attack upon the northern herd. In October, 1883, the last thousand head were killed in southwestern Dakota, by Sitting Bull and about a thousand Indians from the Standing Rock agency, leaving only the Yellowstone Park bunch of two hundred head, a band of forty in Custer County, Montana, and the

AMERICAN BISON, OR BUFFALO.
Photographed in the New York Zoological Park.

In those days, mighty hosts of Buffaloes frequently stopped or derailed railway trains, and obstructed the progress of boats on the Missouri and Yellowstone rivers.

In 1869, the general herd was divided, by the completion of the Union Pacific Railway, into a "northern herd" and "southern herd." The latter was savagely attacked by hide hunters in the autumn of 1871, and by 1875, with the exception of three very small bunches, it had been annihilated.

In 1880, the completion of the Northern Pacific Great Slave Lake herd of about five hundred head.

The largest Buffalo ever measured by a naturalist is the old bull which was shot (by the author) on December 6, 1886, in Montana, and which now stands as the most prominent figure in the mounted group in the United States National Museum. His dimensions in the flesh were as follows:

	FT.	IN.
Height at shoulders	5	8
Length of head and body, to root of tail	10	2

	FT.	IN.
Depth of chest	3	10
Girth, behind forelegs	8	4
Circumference of muzzle, behind nostrils	2	2
Length of tail vertebrae	1	3
Length of hair on shoulders		6½
" " " " forehead	1	4
" " chin beard		11½
Estimated weight	2,100 pounds	

The shoulder height of wild Buffaloes of various ages, and both sexes, as taken by me on the Montana buffalo range, are as follows:

	FT.	IN.
Male calf, 4 months old	2	8
" one year old	3	5
" two years old	4	2
" five years old (average size)	5	6
Female, three years old	4	5
" eight years old	4	10

The Buffalo begins to shed its faded and weather-beaten winter coat of hair in March, and during April, May, and June it presents a forlorn appearance. The old hair hangs to the body like fluttering rags, and at last, when it finally disappears, the body is almost bare. At this time the flies are very troublesome. By October, the new coat is of good length and color, and in November and December it is at its finest.

The Buffalo breeds readily in captivity, and is easily cared for. The majority of captive animals are reasonably tractable, but occasionally an individual becomes savage and dangerous, and requires either solitary confinement or shooting. The best place in which to exhibit a savage Buffalo is a museum. Full-grown males must be watched closely for signs of permanent ill temper, and a savage Buffalo should be treated the same as a tiger. Frequently the first serious sign of danger in a Buffalo is the murder of a weaker member of the herd.

Since 1902 a great amount of American Bison history has been made. In our country the most prominent factors were Congress, the United States Department of Agriculture, the American Bison Society (Edmund Seymour, President), and the New York Zoological Society. In Canada the whole burden of Bison salvage has been borne by the Canadian National Government, and with wonderful success.

In 1902 the United States Government gave the Interior Department $15,000 with which to start a National Bison herd in the Yellowstone Park. In 1907 the New York Zoological Society delivered a gift herd of fifteen Bison at the Wichita National Bison Range, which had been created by act of Congress, with $15,000, in 1906. In 1908 Congress appropriated $40,000 for the Montana National Bison Range, and in 1909 the American Bison Society placed therein a gift herd of thirty-seven Bison. In 1913, as a gift from the New York Zoological Society the American Bison Society delivered fourteen Bison in the new federal Bison range that the government had established in Wind Cave Park, South Dakota.

In due course, other national Bison herds were established in the following national parks and reservations: Niobrara, Sully Hill, Pisgah, and Platt. Altogether there now are nine national Bison herds, with a total Bison population (in 1926) of 1887 head, with an additional wild increment of about 125 head in the Yellowstone Park.

It is now in order, representing the atonement for the sins of the American people against the Bison millions between 1870 and 1884, to set forth the admirable census table of M. S. Garretson, Secretary of the American Bison Society, covering all rescue operations, public and private, from 1889 to 1927. It is impossible to set forth here the very important part that has been played in the saving of America's most conspicuous animal species by the private owners and breeders. However, "honorable mention" is due C. J. Jones, Joseph Allard, Michael Pablo, Charles Goodnight, Austin Corbin, James Phillip, Charles Conrad, Gordon W. Lilly, and the Miller Brothers. Practically all the captive Bison of America and Canada have descended from the herds of those preservers and breeders, and a few others.

Ever since 1889 it has been known that small and widely scattered bands of wild Bison inhabit the thinly wooded but well-grassed sub-arctic region north of the Peace and west of the Slave Rivers, in Alberta and Northwest Territory. The author's original estimate of 550 head in 1889 proves to have been a good one.

It was not until 1914 that the Canadian Government announced the fact that the northern (Northwest Territory) herd contained about 500 Bison, and the southern (Alberta) herd numbered at least 1,000. The protection of those herds was then organized and increased, and the territory was at once (1915) established as the Canadian Wood Buffalo Park, of 10,500 square miles.

Since that date the government of Canada, in order to relieve the overstocked condition of the Bison Park at Wainwright, Alberta, has, with great enterprise and skill annually made large shipments of young Bison from its Bison Park, 400 miles by rail and 300 miles by specially built river barges, and liberated them at La Butte Landing, Slave River, on the eastern boundary of the Wood Buffalo Park. The totals shipped and thus relocated up to 1927 were: In 1925, 1,634 and in 1926, 2,011. The shipment of 1925 immediately found for itself good winter feeding grounds (south of the park) and wintered there very successfully, returning to the Park in the spring; and thus is the success of the enterprise assured.

CENSUS RECORDS OF BISON IN NORTH AMERICA.

All save the first and second were made for the American Bison Society.

	UNITED STATES		CANADA		THE WORLD
	CAPTIVE	WILD	CAPTIVE [2]	WILD	TOTAL
1889—Wm. T. Hornaday	256	285 [1]	.....	550	1,091
1903—Frank Baker	969	34	41	600	1,753
1908—Wm. T. Hornaday	1,091	25	476	300	2,047
1910—Wm. P. Wharton	1,007	25	626	450	2,108
1911—Wm. P. Wharton	1,331	25	954	450	2,760
1912—Wm. P. Wharton	1,288	25	1,144	450	2,907
1913—Wm. P .Wharton	1,675	25	1,303	450	3,453
1914—Wm. P. Wharton	1,668	25	1,575	450	3,718
1916—Edmund Seymour	2,305	60	2,727	500	5,645
1918—M. S. Garretson	2,773	70	3,123	500	6,523
1919—M. S. Garretson	3,048	70	3,743	500	7,418
1920—M. S. Garretson	3,303	90	4,580	500	8,539
1921—M. S. Garretson	3,427	100	4,916	800	9,311
1922—M. S. Garretson	3,554	100	7,510	800	12,053
1923—M. S. Garretson	3,753	125	7,579	1,000	12,521
1924—M. S. Garretson	4,167	125	8,877	1,200	14,445
1926—M. S. Garretson	4,251	125	10,457	1,500	16,417

The number of buffalo in foreign countries has each year (save 1889) been added to and included in the "total" column. This will account for what may appear to be discrepancies in addition after 1889. The increase will represent the number of buffalo in foreign countries, in the years mentioned.—M. S. Garretson.

[1] In the United States 85 were wild and unprotected and 200 were wild in the Yellowstone Park.

[2] For 1889 Canada's captive Bison are merged with those of the United States in the total of 256.

The Musk-Ox.

The Musk-Ox[1] is an inhabitant of the frozen North, the land of snow and ice, of howling storms and treeless desolation. In 1901, Commander Peary killed a specimen within half a mile of the most northerly point of land in the world,—the northeastern extremity of Greenland.

How this animal finds food of any kind during the dark and terrible arctic winter, is yet one of the secrets of Nature. After making all possible allowance for the grass, willow, and saxifrage obtainable by pawing through the snow, and on ridge-crests that are swept bare by the blizzards, it is still impossible to explain how the Musk-Ox herds find sufficient food in winter, not only to sustain life, but actually to be well fed.

I gaze upon each living Musk-Ox to be seen in captivity with a feeling of wonder, as if it were a creature from another world. There are times, also, when I wonder whether many of the visitors who see them quietly munching their clover hay, appreciate the effort that has been put forth to capture them in the remote and desolate regions of the far North, keep them alive, and bring them to civilization for public exhibition.

[1] *O'vi-bos mos-cha'tus.*

The Musk-Ox is one of the strangest of all our large animals, and its appearance is so odd and striking that when once seen by an observant person it is not easily forgotten. In it one sees an oblong mass of very long and wavy brown hair, 4½ feet high by 6½ feet long, supported upon very short and post-like legs that are half hidden by the sweeping pelage of the body. The three-inch tail is so very small and short it is quite invisible. There is a blunt and hairy muzzle, round and shining eyes, but the ears are almost invisible.

The iris of the Musk-Ox is of a chocolate brown color, the pupils are elongated, and bluish-purple.

BULL MUSK-OX.

The lips and tip of the tongue are also bluish-purple.

The outer hair is a foot or more in length, and often touches the snow when the animal walks. In the middle of the back is a broad "saddle-mark," of shorter, dull-gray hair. Next to the body is a woolly coat of very fine, soft, light-brown hair, very clean, and so dense that neither cold nor snow can penetrate it. This is for warmth. The longer and coarser hair that grows through it is the storm-coat, to shed rain and snow. Our first Musk-Ox began to shed its woolly under-coat on April 10. On April 26, it was loose all over the body, and beginning to hang in rags; therefore, for both the comfort and the appearance of the animal, we threw her upon the ground, held her securely, and combed it all out. It was very fine, curly, free from oil, and the entire mass weighed six pounds.

Although known for more than a century, the Musk-Ox is one of the last of the large land mammals of the world to come into captivity for public exhibition, and it was not until 1900 that its soft anatomy was studied for the first time.

Anatomically, this animal presents a few sheep-like features. By some writers their importance has been so much exaggerated that the name "Musk-Sheep" has been proposed as a substitute for Musk-Ox. But the sheep-like characters are insignificant in comparison with those that are clearly ox-like.[1]

Two species have been described. That of the Barren Grounds of the mainland of North America has long been known as *Ovibos moschatus*. In 1901 the animal of Greenland and northern Grinnell Land was described as *Ovibos wardi*, the White-Fronted Musk-Ox, because of a band of gray or dirty-white hair, extending across the top of its head.

Although this animal is called a Musk-Ox, it has neither the odor nor taste of musk, and its flesh is excellent food. General Greely, Commander Peary, and many other explorers have feasted on its flesh. In their native desolation, these animals go in herds of from twenty to fifty head, are easily brought to bay by dogs, and under such circumstances they stupidly stand facing their enemies until killed.

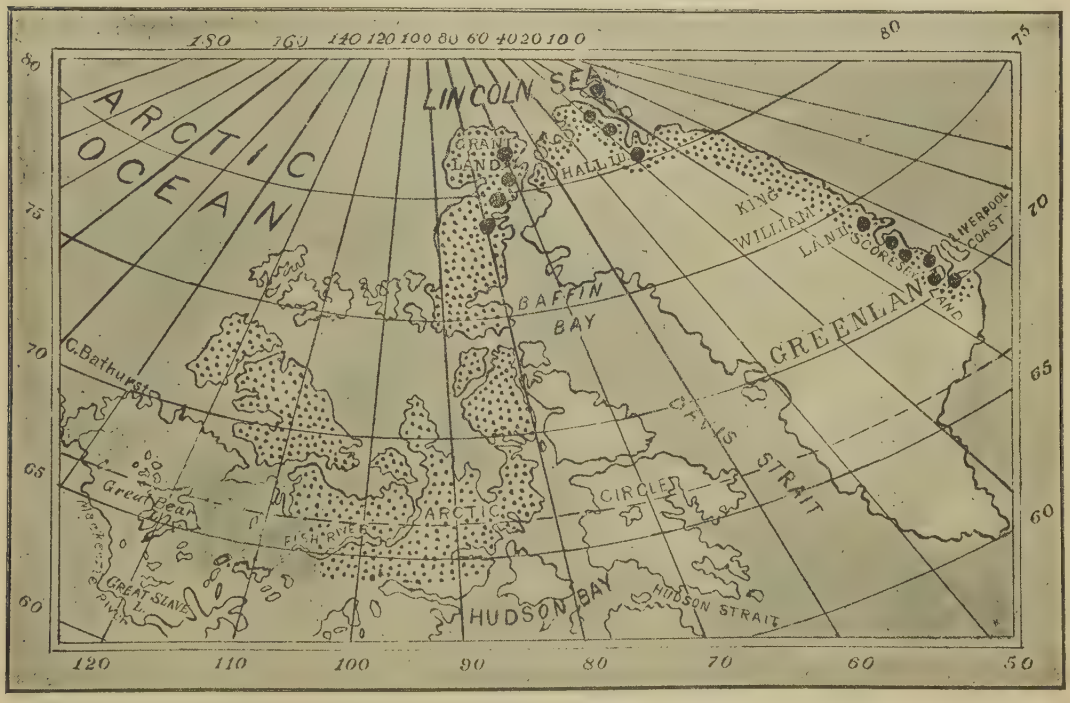
General A. W. Greely states that the average weight of ten Musk-Oxen, dressed, was 360 pounds, while the heaviest weighed 432 pounds. This would indicate an average live weight of 404 pounds, and a maximum live weight of 604 pounds.

The range of the Musk-Ox genus during historic times extended much farther westward than American naturalists supposed in 1904. In 1911 it was clearly established by Charles D. Brower,

[1] See E. Lonnberg, on the *Anatomy of the Musk-Ox*, in the Proceedings of the Zoological Society of London, 1900.

resident trader at Point Barrow, Alaska, that in the days of the fathers of Eskimo then living, Musk-Oxen lived as far westward as the longitude of Point Barrow. This was proven by recent musk-ox remains collected by Mr. Brower.

From that point of departure, the Barren Ground Musk-Ox species (*O'vi-bos mos-cha'tus*) extended eastward to Hudson Bay. The White-Fronted species (*O. wardi*) is found on Melville Island and Grant Land, eastward to northeastern Greenland, and thence southward along the land that the latest (1926) Canadian explorer of the region adjacent to and north of Chesterfield Inlet was of the opinion that "possibly 250 individuals remain alive in that country, but no more." This sudden extinguishment in the eastern Barren Grounds has been accomplished by the fur-hunting Eskimo of that arctic coast, who have been supplied by fur traders with breech-loading rifles, and urged to kill Musk-Oxen for food, instead of spending valuable time in hunting seals for food.



RANGE OF THE MUSK-OX.

Heavy black spots signify actual occurrences. The dotted area indicates the range of the genus in 1927.

Greenland coast to Franz Joseph Fiord (Lat. 70°). At the most northerly point of Greenland, which is the farthest north land of the world, Commander Peary found a small herd of Musk-Ox, and thankfully killed enough for the needs of his hungry men and dogs.

On the mainland of North America a great decrease in Musk-Ox has taken place. Starting at Point Barrow the Barren Gound species has been so nearly exterminated on the whole main-

In 1917 the Canadian Government enacted a Game Act which established the whole of Banks, Victoria, and Melville Islands, and the Back's River region as Musk-Ox preserves, to preserve the remaining herds from all killing operations, save by natives "in need of meat to prevent starvation." And, furthermore, no white man save a bona-fide explorer seeking food only, may now kill a Musk-Ox anywhere on Canadian arctic territory without a special license from the gov-

ernment, and even a holder of a license may take no more than two specimens. Commercial skin-hunting is entirely forbidden.

The New York Zoological Park has had excellent success in keeping the Musk-Ox alive and thriving up to six, seven, and eight years of age.

Up to 1924 it had received one Barren Ground Musk-Ox from Cape Bathurst; one White-fronted from Melville Island; one from Fort Conger (Grant Land) and six from Ellesmere Land. In 1924 five came from Franz Joseph Fiord, eastern Greenland, and then for the first time in New York the sexes present rendered breeding possible. The East Greenland herd is well supplied with females, and in September, 1925, when the two oldest females were only two and one half years old, two perfect calves were born. Unfortunately, the mother milk available was insufficient to maintain the offspring. Artificial feeding was of no avail, and each calf survived only four days. The largest one stood 18 inches high at the shoulder, and weighed 16 pounds. So far as we are aware, those were the first Musk-Ox calves ever bred and born in captivity.

The intelligence of the Musk-Ox is by turns adequate and defective. It does not fully recognize the dangerous character of man, and it does not know that every wild animal should fly from his presence, fast and far. For thousands of years the Musk-Ox herds have been preserving

WILD MUSK-OX HERD AT FRANZ JOSEPH FIORD, E. GREENLAND.
The figure in the foreground is that of Prof. A. G. Nathorst. Photographed by E. Nilson, Lat. 73° 30′.

their calves from the hungry wolf packs of the north by military strategy quite equal to "the British square." When wolves threaten a herd, it at once forms a compact circle, with the adult bulls and cows standing shoulder to shoulder in the outer circle, and with all the calves and young stock safe inside. Even to hungry wolves that circle of deadly down-dropping horns is impregnable. A bull may leave his place for a moment, to rush out thirty yards or so in an effort to puncture a wolf, but he never is lured too far. Back he goes to the circle, backs into his place, and plays the game to the end.

Now, although that plan is exceedingly wise in

defense against wolves, with man as the enemy it is fatal. It means the easy shooting down of the entire herd! Is it not too bad? The Musk-Ox only dimly realizes the deadliness of firearms, and, worst of all, he has not yet learned that the Eskimo and the Indian now have deadly repeating rifles instead of old-fashioned spears.

The Mountain Sheep.

High on the mountain's frowning crest,
Where lines of rugged cliff stand forth,
Where Nature bravely bares her breast
To snowy whirlwinds from the north;
High in the clouds and mountain storms,
Where first the autumn snows appear,
Where last the breath of springtime warms,
—There dwells my gallant mountaineer.

And truly he is a gallant mountaineer. Wherever found, the Mountain Sheep is a fine, sturdy animal, keen-eyed, bold, active and strong. It fears no storm, and defies all enemies save man and domestic sheep. From the former it receives bullets, from the latter, disease. Whether its home is the highest crags of the saw-tooth ranges, the boldest rim-rock of the mountain plateaus, or the most rugged "bad-lands," it is always found amid the scenery that is grandest and most inspiring.

On December 31, 1926, the Mountain Sheep population in the National Forests of the United States as made by the United States Forest Service, stood as follows:

Alaska, 2,000; Arizona, 239; California, 775; Colorado, 3,888; Idaho, 1,276; Montana, 1,796; New Mexico, 200; Nevada, 175; Oregon, 40; Utah, 247; Washington, 10; Wyoming, 2,639; Total, 13,285.

All the year round this animal is well fed, and its savory flesh invites constant pursuit by the mountain lion, and by hunters both white and red. The massive, curving horns and handsome head of the adult ram, taken amid grand mountain scenery, with much difficulty and no little danger, constitute, in my judgment, one of the finest trophies that a true sportsman can win. But it must be clean, and not haunted by the ghosts of slaughtered ewes and lambs! One of the greatest days of my life was that on which I pursued and killed, alone, amid the grandeur of the Shoshone Mountains, my first big Mountain Ram. It was then that I learned how much a Mountain Sheep needs to be seen in its native cloudland in order to be fully appreciated. It is an animal for which my admiration is as boundless as the glories of its mountain home.

The Mountain Sheep is a bold and even reckless climber. It is robust and strong on its legs, yet active withal, and capable of feats of endurance that really are astonishing. It cannot, and never did, "leap from a height, and alight upon its horns,"—save by some neck-breaking accident. When pursued it can, however, dash down an appalling declivity, touching here and there, and land in safety, when to the observer it seems certain to be dashed to death.

The young are born in May or June, above timber-line if possible, among the most dangerous and inaccessible crags and precipices that the mother can find. Her idea is to have her offspring begin its life in places so steep and dangerous that a very slight effort on its part will suffice to keep it beyond the reach of foes. The lamb's most dangerous enemy is the eagle, against which the mother successfully guards it.

Except the burrhel and aoudad, any adult Mountain Sheep, from either the Old World or the New, can readily be recognized by its massive, round-curving horns, which, when seen in profile, describe from one-half to three-fourths of a circle, or more. *No wild animals other than wild sheep have circling horns.* The largest species of wild sheep are found in Asia, and are known respectively as the argali, and Marco Polo's sheep. The horns of the argali are the greatest in size and weight, and those of Marco Polo's sheep have the greatest length and widest spread.

Eight species of Mountain Sheep are found in North America, of which seven have been described since 1883. They are scattered from the northern states of Mexico through the Rocky Mountains almost to the shore of the Arctic Ocean, and throughout one-half of Alaska, a range fully 3,600 miles long.

Of the leading species, six will receive special notice.

The Big-Horn, or **Rocky Mountain Sheep,**[1] has been known for exactly a century, and it is the species which is most widely known in America. Once quite abundant throughout the Rocky

[1] *O'vis can-a-den'sis.*

Mountains from Mexico to Latitude 60° in northern British Columbia, it has been so persistently hunted and slain that now it exists only in small bands, in widely separated localities. In all of our western states, save

DISTRIBUTION OF MOUNTAIN SHEEP IN NORTH AMERICA IN 1927.

1. Big-Horn Sheep (*Ovis canadensis*).
2. Mexican Sheep (*O. mexicanus*).
3. Includes three species: Nelson's Sheep (Cal.); the Lower California Sheep; and in Northwest Sonora the Pinacate Dwarf Big-Horn.
4. White Sheep (*O. dalli*).
5. Black Sheep (*O. stonei*).
6. Fannin's Sheep (*O. fannini*).

Wyoming, the killing of Mountain Sheep is now prohibited for long periods, and it is hoped that these laws will be enforced and respected. Wherever they are ignored, the wild sheep are doomed to extinction.

The general color of the Big-Horn is gray brown, with a large white or cream-yellow patch on the hind quarters, completely surrounding the tail. A large ram killed by the author in the Shoshone Mountains, Wyoming, on November 16, 1889, stood 40 inches high at the shoulders, was 58 inches in length from end of nose to root of tail; its tail was 3 inches long, and its weight was about 300 pounds. Although the snow on its wild pasture was knee deep, and the sheep were pawing through it to reach the tallest blades of dry grass, they were as well fed and fat as if they had been feeding at a manger.

In the State of Chihuahua, Mexico, is found the **Mexican Mountain Sheep,**[1] in color much

[1] *O'vis mex-i-can'us.*

From a painting by Carl Rungius.

THE MASTER OF THE TRAIL.

A Mountain Lion lying in wait on a narrow sheep-trail, high up on a mountain side, is dismayed by the great size and threatening aspect of the leader of the band of Big-Horn.

like the California species, but larger, and with large ears. The horns sometimes reach 16½ inches in basal circumference.

The Pinacate Dwarf Big-Horn (*O. canadensis*) of northwestern Sonora, Mexico, was virtually discovered in 1907 by Dr. Daniel T. MacDougal, of whose party the author was a member. It represents one branch of the Mountain Sheep genus in North America at its jumping-off place. On account of the Pinacate lava, the fierce heat, and the awful scarcity of food and water, the Pinacate terminal sheep are only two-thirds the size of the well-fed and big northern Big-Horn, and their hair is very short and harsh. In 1923 President Obregon, by an executive decree, gave all the Mountain Sheep and antelope of Mexico a ten-year closed season, with severe penalties for killing.

The Lower California Big-Horn (*O'vis crem-no-ba'tes*), confined to the Peninsula, seems to be the largest Big-Horn south of Canada. Reference is made to its horn measurements in the list on page 112. This highly interesting species exists only in very small and rapidly diminishing numbers. On one pretext or another the owners of "ranches" are said to be permitting its slaughter on their holdings, and its protection is so difficult that its survival is, to say the least, highly uncertain.

The White Mountain Sheep, or **Dall's Sheep,**[1] of Alaska, discovered and described by E. W. Nelson in 1884, is an animal of very striking appearance. When its hair has not been stained by mud or dirt, it is everywhere pure white, and its horns have a yellowish, amber-like appearance. From May to September, during the shedding period, the hair is so short and so often stained by reddish earth, that the skin is almost worthless as a trophy. From October to February, however, the pelage is very long and thick, and snow white. This species is noticeably smaller than the Big-Horn, and the horns are smaller and more slender in proportion. A large adult ram measures 39 inches high at the shoulder, and the ewe 33½ inches.

HEAD OF WHITE MOUNTAIN SHEEP.
Shot and photographed on the Kenai Peninsula, Alaska, by Harry Pidgeon.

By reference to the map, it will be seen that this species is very widely distributed throughout Alaska and the Yukon Territory. Ten years ago it was abundant on the Kenai Peninsula, and the head of Cook Inlet, but many have been killed, and the number greatly reduced. Recently Congress has passed a new game act for the better protection of all the large game animals of Alaska.

The Black Mountain Sheep, or **Stone's Sheep,**[2] of northern British Columbia, is distinguishable by the wide spread of its horns, the dark-brown color of its sides and upper parts generally, and white abdomen. It is of the same

[1] *O'vis dall'i.* [2] *O'vis stone'i.*

Painted by Carl Rungius.

WHITE MOUNTAIN SHEEP AND BLACK MOUNTAIN SHEEP.

size as the white sheep, but the two species together form a striking contrast. The precise range of the Black Sheep is south of the head waters of the Stickeen River. Although this species and the white sheep have not yet been found inhabiting the same locality, it is probable that they will be, and we have ventured to show both in one plate.

Fannin's Mountain Sheep[1] is also a new species, found first on the Klondike River, Yukon Territory, in 1900. It is about the size of the white sheep, and has a snow-white head, neck, and tail-patch, and a bluish-gray body, like a white sheep covered with a gray blanket. It also has a blue-gray tail, and a band of brown running down the front of each leg. The first specimen was sent from Dawson City to the Provincial Museum at Victoria, B. C., in 1900, and since then others have reached New York.

In the table below are given the measurements in inches of some of the largest and finest wild-sheep horns with which I am personally acquainted.

Origin of American Mountain Sheep.—It seems highly probable that a number of species of North American mammals and birds were acquired by immigration from the Old World. Of this there is no stronger evidence than that furnished by the genus *Ovis*, which was cradled in the mountains of Central Asia. Western Mongolia and Thibet have produced the colossal argali, the wonderful, wide-horned Polo sheep and the robust Siar sheep.

As the genus spread southward, it produced the small urial and burrhel, and stopped short at the northern edge of the superheated plains of India. But northward, its fate was very different. From the place of its nativity,—let us say the Altai Mountains,—there stretches northeastward through Siberia and Kamchatka, Alaska, and British Columbia to northern Mexico a practically unbroken range of Mountain Sheep, 7,500 miles long. From northern India to northern Mexico, the species stand in the following order: burrhel and urial; Argali and Polo's sheep; Siar sheep; Kamchatkan sheep; white sheep; black sheep; big-horn; Nelson's and Mexican sheep.

It requires no stretch of the imagination to behold Bering Strait choked with the great polar ice-pack, and hardy, strong-limbed bears, wolves, mountain sheep and reindeer crossing over the sixty miles that now separate Asia from Alaska,

[1] *O. fan'nin-i.*

MEASUREMENTS OF MOUNTAIN SHEEP HORNS IN THE NATIONAL COLLECTION OF HEADS AND HORNS, NEW YORK ZOOLOGICAL PARK. (In inches.)

		LOCALITY.	BASAL CIRCUMFERENCE.	LENGTH ON OUTER CURVE.	SPREAD.	DONOR.
Siberian Argali,	*Ovis ammon,*	Altai Mts.,	19½	59⅛	40	The Author.
Marco Polo's Sheep,	*O. poli,*	S. Thibet,.	15¾	60¾	50	Percy Radcliffe.
Siar Sheep,	*O. siarensis,*	Siar Mts.,	15½	47¼	30½	The Author.
Big-Horn,	*O. canadensis,*	Alberta,	16½	40½	17	The Author.
Lower California Big-Horn,	*O. cremnobates,*	Lower Cal.,	16¼	42½	25¾	Geo. H. Gould.
Nelson's Big-Horn,	*O. nelsoni,*	Funeral Mts.,	15	33¾	21¾	——
Black Sheep,	*O. stonei,*	Cassiar Mts.,	14⅓	43¼	30	Wilson Potter.
Dall's White Sheep,	*O. dalli,*	Yukon Terr.,	14¼	41⅜	29	F. H. Osborn.
Kenai White Sheep,	*O. kenaiensis,*	Kenai Penin.,.	13	38⅜	20⅛	Emerson McMillin.
Mexican Sheep,	*O. mexicanus,*	N. Mexico,	16½	35	18¼	——

Painted by Carl Rungius.

ROCKY MOUNTAIN GOAT.

HORNS OF ASIATIC AND AMERICAN MOUNTAIN SHEEP.

1. Siberian Argali. No. 1 in list on page 112.
2. Marco Polo's Sheep. A specimen of medium length, only.
3. Big-Horn. No. 4 in list. A very large pair.
4. White Sheep. No. 9 in list; of unusual length.

and spreading in all directions over North America. I fully believe that the parent stock of our mountain sheep, caribou, moose, wolves, and bears came from Asia by this route.

The Rocky Mountain Goat, or White Goat,[1] is an animal of surpassing interest. Since 1904, much has been learned of its character, life history, and distribution.

In the first place, the Rocky Mountain Goat is not "a stupid animal." While it is impossible for him to perpetually keep from being seen by hunters, and he has no recourse against high-power rifles that can kill a goat or sheep at a quarter mile, he does know how to live and thrive at the highest and most storm-beaten altitudes that are inhabited in North America by hoofed animals.

As a mountaineer and crag-climber, he surpasses all the other large mammals of America. He walks with the utmost nonchalance across the faces of sheer rock cliffs, on ledges so narrow that they are invisible to hunters, and so dangerous that mountain sheep never set foot upon them. In such places his gait is peculiar, and even amusing. Knowing the necessity of caution and good footing, he plants each hoof with a degree of precision and firmness that give him a gait like a mechanical toy, and about the same degree of grace.

The Mountain Goat is stockily built,—for strength in climbing, not speed. His legs are short and thick. He has enormous dew-claws, to act as brakes in getting down steep places; and his big hoofs consist of a ball-like rubber pad (for rock), surrounded by a knife-edge of horn,—for snow and ice.

The Goat is no good whatever at leaping or jumping. He runs slowly; and he climbs slowly, lifting his heavy body by the sheer muscular power of his forelegs and shoulders. But the way he can climb a rock wall that seems perpendicular is amazing. Sometimes the front hoofs are used as hooks, in holding on until the hind feet can make good.

His horns are exceedingly appropriate to him. They are small, black, smooth, round, sharp as daggers at the point, and on all living enemies the Goat can use them with terrible effect. There is one absolute record of a large grizzly bear that was killed by a Goat in a fight in which the Goat

[1] *O-re-am'nos mon-tan'us.*

also perished. Large Goat horns are from 9 to 11 inches long.

In clothing the Mountain Goat, Nature forgot all about protective coloration! In the fall, this animal's pelage is brilliantly white, immaculate and visible from afar. It consists of a dense under coat of fine hair protected from rain by a long, coarse rain-coat of hair growing through the fur. Although its pelage is the warmest to be found on any wild hoofed animal of America save the musk-ox, it easily becomes water-soaked; and in the East, where cold winter rains are frequent, all White Goats left exposed to such rains will quickly die of pneumonia.

The first Mountain Goat ever bred in captivity was born in New York's Zoological Park on May 20, 1909; and it was reared to maturity.

The White Goat is not really a grazing animal. It is a botanist and a browser. Its "favorite" food consists of more than a dozen different plants, such as lace-leaved anemone, mountain sorrel, wild valerian, yellow willow, squaw-weed, mountain timothy, and wild pea and strawberry. Its flesh is not "musky" nor "stringy" nor "tough," but in spring, when wild onions are abundant on the slides, its flesh becomes flavored by that dainty vegetable.

The standing shoulder height of a really big male Goat is from 40 to 42 inches, and the adult males weigh between 250 and 276 pounds.

The horns are so small that sportsmen do not value them, and it is a greedy hunter who is not satisfied with two or three heads. As wearable "fur," the skin is utterly worthless, having no good qualities whatever.

The present geographical range of the White Goat extends from Idaho and Washington to the head of Cook Inlet, Alaska. The 1926 "Summary of Big Game Animals in National Forests," of the United States Forest Service, credits twelve counties in Idaho with 3,042 Goats, six counties in Washington with 2,125, and nine counties in Montana with 4,248. Alaska is credited with an estimated 9,000, making a total for the United States and Alaska of 18,418 head on December 31, 1926. For the States, the increase over the count of 1924 is 1,174,—a very satisfactory showing.

The bulk of the Goat population of North America is to be found in British Columbia, in the Coast Range and the Rockies, and along the Stickine and Skeena Rivers. In Yukon Territory they inhabit the Rockies from the Liard River up to about Lat. 63°, but from that line to the Coast Range at Mt. St. Elias there are none.

For fifty years the mind of the White Goat was completely misunderstood. Had it been a "stupid" animal, it never could have survived on the dangerous and difficult summits of the sub-arctic mountains it inhabits. The White Goat is an animal of steady nerves, indomitable courage, and excellent reasoning powers. No matter what the danger or emergency, he does not get nervous and he never "loses his head." When attacked and cornered on a narrow ledge of a sheer precipice he faces his enemy defiantly, stands at bay, and waits to see what his enemy is going to do next. No crazy leaping off into space for him! He will fight anything that attacks him,—dogs, men, horses, or grizzly bears.

He does not quarrel with the mountain sheep, over range rights, water nor aught else. Those two species live amicably in the same territory.

In captivity they do not make good pets. They are suspicious of the human hand, and when forcibly caught they strike dangerously with those deadly little horns. In captivity they also become impatient, and then one with a bad heart will wickedly horn its mates.

PRONG-HORNED ANTELOPE FAMILY.

Antilocapridae.

This unique Family of one species and one subspecies, must not be confused nor in any way connected with the large and important group of African antelopes, which contains a grand array of animals of all sizes, many of them odd, and many of them noted for their beauty. The student who has a special liking for the large hoofed animals surely will find pleasure in making the acquaintance of such superb creatures as the sable antelope, the koodoo, the water-buck, the eland, the oryx, the gnu, the pallah, and the hartebeest of Africa. We have reason to envy Africa her exclusive possession of all those fine creatures, not to mention her other hoofed animals, great and small.

The Prong-Horned Antelope[1] is found only in North America, and it possesses so many ana-

[1] *An-ti-lo-cap'ra americana.*

tomical peculiarities, found in no other animal, that zoologists have created for it a separate Family, which it occupies in solitary state. It is like an island in a vast sea, unrelated. Let him who hereafter may be tempted, either lawfully or unlawfully, to raise a death-dealing rifle against one of these beautiful prairie rovers, remember two things before he pulls the trigger: In this land of plenty, no man really needs this creature's paltry pounds of flesh; and if his two-cent bullet flies true to the mark, it will destroy an animal more wonderful than the rarest orchid that ever bloomed.

Remember the ages which Nature has spent in fashioning this wonderful combination of keen eye, fleet foot and graceful limb, and preserving it from the extermination which overtook the great reptiles, rhinoceroses, and toothed birds of the vast inland sea now known as the Uintah Basin. Surely this animal is worth perpetual protection at our hands, rather than needless, cruel and inexcusable slaughter. *It cannot be perpetuated by breeding in captivity; and unless preserved in a wild state, it will become extinct.*

Behold the list of characters, in which this animal differs from all other antelopes: Although its horns grow over a bony core, they are *shed and renewed every year;* the horn bears a prong, and is placed directly over the eye; the feet have no "dew-claws"; the hair consists of a hollow tube filled with pith, coarse, harsh, straw-like and easily broken; and all the hair on the rump is fully erectile, like the bristles of swine. When fighting, or alarmed, this white hair is instantly thrown up, and on a fleeing animal it forms a dangerously conspicuous and inviting mark. To my mind, the white rump-patch of the Prong-Horn is one of Nature's errors. It enables a pursuer to mark the animal long after it should really become invisible.

Painted by CARL RUNGIUS.

PRONG-HORNED ANTELOPE.

The Prong-Horned Antelope is next in size to the smaller species of our mountain sheep. It is smaller than the white-tailed deer of the north, but as large as the southern forms. The largest specimen in the Zoological Park herd measures 37½ inches high at the shoulders, has a head and body length of 47¾ inches, tail, 3½ inches, and chest circumference of 35 inches. Its horns are

12⅛ inches long and 12½ inches wide between the tips. The longest horns on record are 17 inches in length, but any that measure 12 inches may fairly be considered large. The female has no horns.

The colors of this animal are usually two, consisting of a cloak of light yellowish-brown thrown over the back and neck of an otherwise white animal. On the throat the brown is laid on in a curious collar-like pattern, and the adult males usually have a wash of black on their cheeks.

Twenty years ago, owing to the well-nigh impossibility of keeping and breeding this antelope in captivity, even in the fenced bison ranges, the outlook for the final survival of the species was most discouraging. Fears were widely entertained that ere long the Prong-Horn would become extinct.

In 1883 California gave the Prong-Horn a perpetual close season. In 1905 a general call was issued to all western states having antelope to stop all shooting of them, and in 1908 and 1909 Montana, Nevada, Oregon and Wyoming responded by taking that action. Other states quickly fell into line, and in a short time all the Prong-Horns remaining in the United States were perpetually protected. But for all that it was generally feared that lawless killing soon would finish the species.

Serious efforts were made by the American Bison Society, the Permanent Wild Life Protection Fund and the Boone and Crockett Club to purchase young antelopes in Canada, and elsewhere, and establish protected herds in the Wichita Bison Range, Montana Bison Range, and the Tonto Plateau, Grand Canyon of Arizona, to help save the species.

And then, by a strange perversity of Nature, scores of free-roaming remnant bands now have proven that small and weak herds can survive and take care of themselves in the lap of civilization, *provided* hunters will obey the law, and let them alone!

In 1925 the United States Department of Agriculture published an admirable Bulletin (No. 1346) by Dr. E. W. Nelson, entitled "Status of the Prong-Horned Antelope, 1922–1924," which completely illuminates its subject at those dates. Says the author:

"Through the occupation of its territory by man the Prong-Horn has become extinct in many of its former haunts, but it has survived in limited numbers over an amazing proportion of its original range in Canada, Mexico, and in sixteen of the western states of this country."

Under his direction as Chief of the United States Biological Survey, and with the assistance of a great number of field agents and other observers, the Survey compiled, from counts and estimates, a census of the antelope bands and individuals alive in 1922 to 1924 in North America. As published, and also mapped, in Bulletin 1346, the results of the census are as follows:

	AREAS	NUMBER OF ANTELOPE
UNITED STATES		
Arizona	18	651
California	6	1,057
Colorado	28	1,233
Idaho	14	1,485
Kansas	1	8
Montana	44	3,027
Nebraska	10	187
Nevada	11	4,253
New Mexico	31	1,682
North Dakota	5	225
Oklahoma	2	23
Oregon	4	2,039
South Dakota	11	680
Texas	42	2,407
Utah	10	670
Wyoming	27	6,977
Total in the United States	264	26,604
CANADA		
Alberta	5	1,030
Saskatchewan	9	297
Total, Canada	14	1,327
MEXICO		
Coahuila	1	600
Chihuahua	1	700
Sonora	4	595
Lower California	2	500
Total, Mexico	8	2,395
Grand Total	286	30,326

At this time (1927) there is in some quarters of Montana and Wyoming some serious unrest among farmers and ranchmen whose crops and sheep grass are being seriously consumed by too many antelope. During the years 1925 to 1927 the Permanent Wild Life Protection Fund has felt compelled to contribute a semi-annual sum to a Wyoming ranch company as compensation for grazing consumed by 1500 antelopes, and as insurance of continued protection for the herds.

It is entirely possible that ere long antelopes will, in a very few localities, become so numerous in districts of intensive farming that measures for

relief will become necessary. The first, and by far the best, is for the State to provide legal machinery and funds for the payment of fair damages to farmers for *prospective profits* on destroyed crops. The second will be the systematic capture of each year's increase in fawns, and their *open sale* to states, or counties, or individuals desiring them for breeding and restocking purposes.

The killing of the surplus males would not stop the increase of depredating herds, and the slaughter would be too painful for the public to endure.

THE DEER FAMILY.

Cervidae.

General Observations.—The Deer Family is well represented on all continents, and on all large islands, save Africa, Australia and New Zealand. There are about forty-five well-defined species and many subspecies. With but one or two exceptions, the species found in the tropics and subtropics are scantily antlered, dull in color, and covered with coarse, thin hair. There is but one tropical deer which is really beautiful, and that is the axis, or spotted deer, of India and Ceylon.

The following facts regarding the deer of the world are worth remembering:

The American Moose is the largest member of the Deer Family, living or extinct.

The American Elk, or Wapiti, is the largest and finest of all the round-horned deer.

The Axis Deer is the most beautiful in color of all deer.

The Moose has the heaviest and most massive antlers, with the widest spread.

Male deer of most species have solid antlers, of bone, branching into several tines.

Deer shed their antlers, and renew them completely, every year.

The young of nearly all round-horned deer are spotted at birth.

All adult male deer are dangerous in the mating season, when their antlers are new and perfect.

The female Caribou is the only female deer with antlers.

The best deer to keep in captivity in a park is the Fallow Deer, of Europe; and outside of its own home, the worst is the Columbian Black-Tail.

Except as already stated, nearly every country in the world is provided with representatives of the Deer Family, according to conditions. Nature has fitted the caribou to live in the awful lands of desolation in the far North, and the moose in the forests fringing the arctic barrens. The elk is fashioned for the plains, the foothills and open-timbered mountains of western America and central Asia. The white-tailed deer skulks in safety through the thickest forests of temperate North America, and in India and the far East the axis deer, the sambar, and the tiny muntjac, with only one or two tines on each antler, have been formed to slip through the tangled jungles with ease and safety.

North America has the good fortune to be rich in Cervidae. It has six prominent types, and at this date (1903), a full count reveals twenty-four recognized species and subspecies, which form a group combining the grand, the beautiful and the picturesque, and of very decided value to man. In the exploration and settlement of the United States, and the exploration of Alaska and the far North, the wild herds have played an important part.

The unvarying distinctive mark by which any American representative of the Deer Family can be recognized is the presence on the male of *solid horns of bone, called antlers, which are shed once a year,* close down to the skull, *and are fully renewed by rapidly growing out in a soft state called "the velvet."* When fully grown, the antlers branch several times; but the first pair, which are grown during the second year, are only two straight and slender spikes, called "dag antlers." The grouping of animals with antlers brings together in the Deer Family not only the true deer, but also the moose and caribou.

Shedding and Renewal of Antlers.—At this point it is necessary to emphasize certain facts regarding the antlers of deer, elk, moose and caribou.

Many persons find it difficult to believe that the antlers of all these creatures drop off close to the skull, every year, and are completely renewed in about four months; but such is the fact. It is Nature's special plan to absorb the surplus strength of the males, and render them weak and inoffensive during the period in which the mothers are rearing their young, when both the does and their fawns would be defenceless against savage males with perfect antlers. It

seems incredible—unless watched from week to week—that the enormous antlers of full-grown moose or elk can be dropped and completely renewed again in as short a period as four months; but it is true.

disc of bone belonging to the frontal bone of the skull. No blood flows. Dropped antlers are sometimes gnawed by rodents until destroyed; but many are picked up by those who look for them. At the end of the first week, the bony disc

"DO ELK SHED THEIR ANTLERS?"
An answer from the New York Zoological Park.

1. March 21.
2. April 8
3. April 30.
4. May 15.

The antlers of North American deer are usually dropped in March, but occasionally in February. Sometimes a day or two passes between the fall of the first antler and the loss of the second. The root, or *pedicle*, exposed is a rough

or seat of the antler is covered over by the dark brown skin of the head. At the end of two weeks, a rounded bunch, like a big brown tomato, has risen on the pedicle of each antler. It is soft, full of blood, and easily injured.

Gradually this elongates into the form of a thick, blunt-ended club, in color brown or pink, shiny, and thinly covered with minute hairs. When fairly started, the antlers of a healthy and vigorous elk or caribou grow at the rate of one-third of an inch per day, or even more. They are soft, spongy, warm, full of blood, are easily injured, and if cut will bleed freely. The material of which they are composed, internally, is the same as that which forms the hair. The drain upon the animal's vitality during this period is very severe, and it is not strange that the animal is then meek and spiritless.

A large pair of elk antlers, dropped in the Zoological Park on March 21st, had been renewed to their full length by June 21st, but the tips were flat and club-like. The first sign of the hardening process was the shrinkage of the blunt tips of the tines to sharp points. Gradually the diameter of the entire antler decreased in size, and at the same time the hair composing the velvet grew longer. The surface now assumed a gray appearance. On August 1st all the points were sharp, and the antlers were in perfect form, but the velvet was all on. (See "The Elk's Calendar," page 122.)

Deer as Dangerous Animals.—The rapid multiplication of deer parks, and small collections of captive animals, renders it necessary to offer a few words of warning regarding deer of all species. During the season immediately following the perfect development of the new antlers,—say September, October and November,—male deer, elk, caribou and moose sometimes become as savage as whelp-robbed tigers. The neck swells far beyond its natural size, the eye-pits distend, and the buck goes stalking about with ears laid back and nostrils expanded, fairly spoiling for a fight. I have seen stags that were mild and gentle during eight or nine months of the year suddenly transformed into murderous demons, ready and anxious to stab to death any unarmed man who ventured near.

At first a buck walks slowly up to his victim, makes a wry face, and with his sharp, new antlers makes believe to play with him. Not wishing to be punctured, the intended victim lays hold of the antlers, and seeks to keep them out of his vitals. On finding himself opposed, the buck begins to drive forward like a battering ram, and then the struggle is on.

Heaven help the man thus attacked, if no other help be near! He shuts his teeth, grips the murderous bone spears with all his strength, leans well forward, and with the strength and nimbleness of desperation, struggles to maintain his grasp and keep his feet. Each passing instant the rage of the buck, and his joy of combat, increases. If the man goes down, and help fails to come quickly, his chances to escape the spears are few.

Once when unarmed and alone, I saved myself from an infuriated buck (fortunately a small one), by suddenly releasing one antler, seizing a fore-leg low down, and pulling it up so high that the animal was powerless to lunge forward as he had been doing. In this way I held him at bay, and at last worked him to a spot where I secured a stout cudgel, with which I belabored him so unmercifully that he was conquered for that day.

The strength and fury of a buck of insignificant size are often beyond belief. The loving "pet" of May readily becomes the dangerous, fury-filled murderer of October. With a large deer of any species, a man not fully armed has little chance. In the winter of 1902, at Helena, Montana, a man armed with a pitchfork entered an elk corral, to show a friend that the large male elk feared him. The elk attacked him furiously, and killed him before he could be rescued.

Men who have charge of deer herds must keep the bucks in a perpetual state of fear. Do not make a pet of any male member of the Deer Family after it is two years old. It is dangerous. In the autumn or winter, never enter an enclosure containing deer, elk or caribou unless armed with a pitchfork, or a long pole of tough wood, with an iron spike in the end. If a buck threatens to attack you, strike him *across the nose;* for that is his tender spot. When angry he can take any amount of punishment on the forehead, neck and shoulders, without its diminishing his energy in the least.

Solitary bucks in small corrals are most dangerous. Where deer run in a large herd, the danger is much less; but if a herd-buck begins to approach people with the slow stride of a pugilist, lips and nose turned up, ears laid back, and snorting defiantly, shut him up at once, or saw off his antlers close to his head, before he does mischief.

Fighting Among Deer.—Even among themselves, deer are murderous brutes. It is quite a common thing for one buck to treacherously assassinate another; and some are such thorough degenerates they will murder their own does and fawns. The largest and handsomest bucks are not always the best fighters, for they often lack the activity and youthful vigor which gives supremacy to a younger animal.

Judging by the number of pairs of deer that have been found dead with their antlers tightly locked, wild deer are much given to fighting during the rutting season. It is to be remembered, however, that male deer are in the habit of playfully sparring with their horns, and it is very likely that many a death-lock has been due to a pushing-match rather than to deadly combat. The antlers of our white-tailed and mule deer are peculiarly adapted to the fatal interlocking that has caused many a fine buck to perish miserably by slow starvation. In captivity, pushing-matches amongst deer are quite common.

The Round-Horned Deer.

The American Elk, or **Wapiti,**[1] is as tall as a horse, handsomely formed, luxuriantly maned, carries its head proudly, and is crowned by a pair of very imposing antlers. Even the doe Elk is a handsome and stately creature; and from the second week after its birth, the fawn steps about with the air of a game-cock.

E. R. Sanborn, New York Zoological Park.

AMERICAN ELK, OR WAPITI.

It is both a grazing and browsing animal. Although up to twenty-five years ago it often ranged far out into the western edge of the Great

[1] *Cer'vus can-a-den'sis.* In Europe, this animal is called the Wapiti; and the European Moose is called the "Elk."

Plains, and loves to frequent mountain parks, it is also a forest animal. Originally, its range coincided to a remarkable extent with that of the buffalo, covering fully three-fourths of the United States, from the Adirondacks and the eastern foothills of the Alleghenies to California and Vancouver Island. It was not found, however, on the Great Plains north of the Saskatchewan.

The Elk herds of the West constitute the great national puzzle in conservation. They are up, and they are down. They are a "nuisance," or they are "starving." A series of mild winters followed by a severe winter is deadly to them. All Elk figures compiled to-day will be out of date and obsolete to-morrow. No matter what plans for Elk "relief" are hammered out this year, next year may see them upset by new conditions, with the Elk agony to be gone over again.

In the winter of 1926–1927, which was unusually mild, and with a minimum of snow, 9,336 of the Yellowstone Park Elk wintered in the Jackson Hole region; and inside the Park boundary 9,807 Elk spent the winter quite successfully. At the same time 3,236 wintered outside the Park, which are to be added to the Gallatin herd of 3,000.

In 1924 an official count of the Olympic Elk Herd discovered a total of 16,783 head.

In its annual "summary of big game in the National Forests," the United States Forest Service publishes the following records of Elk population in 1926: Idaho, 6,840; Montana, 10,593; Colorado, 8,295; South Dakota, 547; Wyoming, 39,008; Oklahoma, 300; Arizona, 768; New Mexico, 85; Utah, 1,716; Nevada, 30; California, 131; Oregon, 4,471; Washington, 9,590; North Carolina, 300; and Pennsylvania, 15. Total, 82,476.

The present (1927) Elk population of Canada is now reported by Hon. J. B. Harkin to be as follows:

Manitoba	4,000
(3,000 in Riding Mt. For. Res.)	
Saskatchewan	5,000
Alberta	3,612
(Jasper Park, 1,200; Rocky Mt. Park, 1,500; Waterton Lakes Park, 65; Elk I. Park, 449)	
British Columbia, about	6,500
Ontario and Quebec, a few.	———
	19,112

Fortunately, Elk are easily bred in captivity. It is a common thing for a zoological park or private owner to become embarrassingly overstocked by breeding.

During the years between 1904 and 1927 many Elk herds under protection in fenced ranges have increased until measures for the dispersal of surplus stock have become necessary. This is true of the Montana National Bison Range, and the herds of the Olympic National Preserve in Washington. A lot of Elk were turned loose in the mountain forests of Pennsylvania, but the bold animals quickly became such a pest to farmers and orchardists that now they must be removed.

Elk hunting once was grand sport in *thirty-two* states, from New York to California. Now, in all states save three, Elk hunting is a dead sport, and the species has disappeared from about 75 per cent of its original home. This is chiefly due to rifles, not plows; for very few Elk ever lived in plow country.

Every winter the Elk herds of the Yellowstone Park migrate southward to feed in the sheltered valleys of Jackson Hole. During these migrations, which usually are made through deep snow, Mr. S. N. Leek and others have made many fine photographs of the herds. One of Mr. Leek's striking pictures is reproduced on the opposite page.

The Elk's Calendar in the New York Zoological Park.

Jan. 1. Pelage has grown perceptibly paler.

Feb. 1. Pelage has lost its lustre, and begins to look weathered.

Mar. 21. Antlers of the largest male dropped, 9 hours apart.

Apr. 8. Each budding antler looks like a big brown tomato.

Apr. 18. New antlers about 5 inches long, thick and stumpy.

Apr. 30. Each antler has developed three branches. Young Elk born, well spotted. Closely hidden in the rocks. Height 26 inches; length 35 inches; weight 30½ pounds.

May 10. Shedding in full progress; the Elk look their worst.

June 1. Shedding about half finished.

June 18. Antlers now full length, but club-like,

THE WINTER HOME OF THE ELK.

Photographed in Jackson Hole, Wyoming, by S. N. Leek.

well haired. Tips flat. Large male has finished shedding.

July 20. Antlers are now sharp at the tips. Flies troublesome. Herd bathes in the pond frequently and long.

Aug. 1. Entire herd now free from winter pelage. Animals look well in short, red summer coat, but smaller! Velvet still on antlers. Spots on young are all gone, and white rump-patch is fully developed.

Aug. 15. Two big males began to rub velvet from antlers, against trees.

Aug. 22. Antlers of one bull almost clean, but velvet still hangs in tatters, like carpet rags. Tips pure white, base looks bloody.

Sept. 15. The summer coat has been completely shed.

Oct. 1. The herd is at its best. All antlers clean and perfect. Pelage long, full, and rich in color. Mating season now on. Bulls aggressive and dangerous. Fawns active and playful. The "bugle" of the bull is a shrill shriek, like an English locomotive whistle, sliding down the scale into a terrific bawl.

Size of Elk.—Professor L. L. Dyche, an exceedingly careful observer, has contributed a striking illustration of the difficulty of obtaining from a dead Elk an accurate measurement of the animal's standing height when alive. The largest and finest male Elk ever taken by him (for the State University of Kansas) fell in Colorado on October 21, 1891. I can testify that it is a grand representative of its species.

As is frequently done, the guide of the party measured its height in a line from the *point of the hoof* to the top of the shoulder, and recorded 65 inches. This being ruled out, the bottom of the hoof was held parallel with the axis of the body, and the elbow *even* with the lower line of the brisket. This gave 62 inches. Professor Dyche then pushed the elbow up to the position it occupies in a standing Elk—about five inches above the lower line of the body—and found the actual standing height at the shoulders to be 57 inches. The head and body length was 97 inches; girth, 73 inches; circumference around abdomen, 81 inches; circumference of neck, 36 inches.

On October 3, 1903, a fine bull Elk in the New York Zoological Park was suffering so intensely from a horn wound in the hock joint that it was chloroformed. Being in fine condition, its measurements and weight were carefully noted, with the following result:

Height at the shoulders	56½ inches.
Length of head, body and tail	86¾ "
Circumference of chest	78 "

Weight.

Trunk	300 lbs.
Skin, head and legs	255 "
Viscera	151 "
Total live weight	706 lbs.

Antlers.

Length, following curves	53 inches.
Widest spread	35 "
Circumference above bez tine	7½ "
Points	7+7=14.

Age about 8 years.

Rule for Obtaining the Live Weight of Deer from Dressed Weight.—So many records of the "dressed" weight of deer are published, it is desirable to offer a simple rule by which anyone can accurately calculate the weight of the animal when alive. Taking an antlered Elk (*Cervus canadensis*) as a basis, we find that the dressed weight represents .78612 of the live weight, or $\frac{5}{10}\frac{5}{06}$ of the whole animal.

The dressed weight being given, in pounds, add to it five ciphers, divide by 78612, *and the result will be the live weight, in pounds.*

While this rule will often prove convenient, the author desires to state that none of the weights recorded in this volume were obtained by it; and any weight so obtained and published always should be marked "as calculated."

The longest and widest Elk antlers are not necessarily the handsomest. Usually, antlers that are of great length are slender, whereas the finest pairs are those of massive proportions, fairly symmetrical, and about 60 inches long. The longest pair of reliable record to this date was purchased in Colorado Springs, Colorado, in 1897 for the Emperor of Germany. Their length of beam was 67½ inches, and their points were twelve

Painted by Carl Rungius.

MULE DEER IN THE BAD-LANDS OF SNOW CREEK, MONTANA.

in number. They were obtained from an animal killed in White River County, Colorado. A very large pair from the Shoshone Mountains, in the author's collection of horns, has a beam length of 58 inches, a spread of 49½ inches, and burr circumference of 11 inches.

Elk hunting is not always as fine sport as the noble individuality of this animal would naturally lead the hunter to expect. Very often the Elk is unsuspicious, to the point of stupidity. There have been many times when attacking a herd was too much like attacking a herd of cattle. It is not an animal of "highly-wrought-nervous" temperament, like the deer, but when startled is too much given to hesitating, and seeking knowledge, before it dashes away to safety.

The Mule Deer, or **Rocky Mountain "Black-Tail,"**[1] is a large and handsome animal, and the largest of the North American species that are universally known as "deer." It is easily recognized by its very large ears, the two Y's on each antler, a short, white tail with a small tip of black, and a white patch around the base of the tail. Its antlers are much larger than those of the white-tailed deer. Owing to their size and width, and their more erect poise on the head, the appearance of this animal is more stately than that of any other round-horned American deer, save the elk.

In the region it inhabits, this fine animal is known as the "Black-Tailed" Deer; but that name is not appropriate to a creature which has a snow-white tail with only a tiny tip of black. It rightfully belongs to the Pacific coast species, which has a black tail, and is known by no other name than Columbian Black-Tail. To avoid further confusion and misunderstandings, students are urged to speak of the Rocky Mountain species as the Mule Deer.

The winter color of the Mule Deer is a steel gray, to match the gray rocks and vegetation amongst which it lives. Its summer coat is gray-brown, and it is shed in September.

The Mule Deer chooses for its home the most picturesque "bad-lands" and foothills of the Rocky Mountain region, and the deep ravines along rivers, but it also ascends the mountain plateaus of its home to an elevation of 12,000 feet. It is a proud-spirited, high-headed animal, a bold traveller, and like the mountain sheep, is often found where the scenery is wild and picturesque. In this respect it differs from the white-tailed deer, which prefers low ground, and either brush or timber in which to hide.

A large Mule Deer buck, shot by the author on Snow Creek, Montana, measured 42 inches high at the shoulders, and 62 + 6 inches in length. A large pair of antlers (in the author's collection) have a beam length of 27¼ inches, spread 29 inches, and have 14 points.

In 1904 the Mule Deer of the United States had reached what seemed to be their lowest point, and the outlook for their future existence was alarming. Fortunately, a change for the better soon was ushered in. The great Kaibab Forest, on the north bank of the Grand Canyon of Arizona, was converted into a deer preserve, with great results in increase, and in 1927 an embarrassing surplus of deer. A pronounced movement throughout the Mule Deer's range set in for the real preservation of that species, and some good gains have been made.

The tide of slaughter is being held back. It's one sad episode was an outbreak in California of the foot-and-mouth disease (of cattle), which attacked the Mule Deer of the Sierras, and caused the killing of thousands of deer to prevent the spread of that dreaded disease.

Of course there are hundreds (or thousands?) of localities which once contained Mule Deer, from which they now are absent. Nine Mule Deer states permit the hunter to kill one horned buck deer per year, and two allow two deer. In the National Parks of the West, Mule Deer are just fairly represented, and in summer they are not at all conspicuous. In winter many come into Mammoth Hot Springs (Yellowstone Park) to be fed.

On the whole, the Mule Deer situation is much more satisfactory than it was in 1904, but there is yet wide room for more improvement.

In the United States the survivors of the Mule Deer species are found in Arizona, California, Nevada, Oregon, Washington, Idaho, Montana, South Dakota, Colorado, Utah, Wyoming and New Mexico.

In Canada this deer is found in Manitoba, Saskatchewan, Alberta, and British Columbia, with northern limits at Jasper House, Smoky River and Stony Rapid on the Athabasca, about two hundred miles below Athabasca Landing.

[1] *O-do-coi'le-us hem-i-o'nus.*

The Mule Deer reaches its largest and finest antler development in the Rocky Mountains, from Colorado to southern British Columbia. The few widely scattered survivors of this species are found to-day in central Chihuahua and Sonora, Mexico; western Colorado and Wyoming, southeastern Idaho, central Montana, and eastern British Columbia. One fact which militates most strongly against the perpetuation of this species is that states and provinces sufficiently wild and unsettled to afford it a home are financially unable to maintain the large force of salaried game-wardens which alone could really protect it from final annihilation.

MULE DEER WITH ANTLERS IN THE VELVET.

This species ranges as far east as western Dakota, and westward to the Blue Mountains of Oregon.

The Mule Deer nearly always produces two fawns at a birth, and sometimes three. In feeding it is much given to browsing on twigs and foliage, but it also grazes freely when good grass is available. In the Snow Creek country of central Montana I found that its October bill of fare consisted almost solely of the long-leaved mugwort (*Artemisia tomentosa*), a species of very pungent and spicy sage, which was eaten greedily to the complete exclusion of the finest grasses I ever saw in the West.

In running, this deer often progresses by a series of stiff-legged leaps, in which it touches the ground lightly with its hoofs, bounds upward as if propelled by steel springs, and flies forward for an astonishing distance. In Manitoba and a few other localities this remarkable gait has caused this animal to be called the **Jumping Deer.** Owing to the fact that it lives in a dry climate and rarefied atmosphere, and subsists on very dry foods, it is difficult to acclimatize it anywhere outside of its own home. East of the Mississippi most Mule Deer die of gastro-enteritis.

The acceptance of protection by wild deer is strikingly displayed every winter at Mammoth Hot Springs, in the Yellowstone Park. When the summer high tide of tourists has completely ebbed, and "stern winter comes to rule the varied year," the Mule Deer come down from the high forests of their summer occupancy, and fraternize with the Park Rangers and other human habitants of Fort Yellowstone. They swarm over the parade ground, for the hay rations there issued to them. They panhandle upon verandahs and at kitchen doors, and occasionally even enter kitchens for the edibles they find therein. The most amusing story of Mule Deer familiarity comes from a hotel at Banff, Alberta, where a presuming doe recently entered a cottage, and promptly bedded down upon an otherwise unoccupied bed, where she was photographed.

The Columbian Black-Tailed Deer,[1] of the Pacific Coast, is smaller than the typical white-tailed deer, and very much smaller than the mule deer. The outer surface of its tail is black all over, and constitutes the best distinguishing character of the species. The antlers are very variable. Occasionally those of old bucks exhibit the double **Y** on each beam which is so characteristic of the mule deer; but in most cases, the double bifurcation is wanting, and the antlers look very much like those of the white-tailed deer. In its body colors it resembles the latter species more closely than the mule deer.

This species inhabits the well-watered and densely shaded coniferous forests of the Pacific coast from the north end of Vancouver Island to central California. It feeds freely upon evergreen foliage, and I have seen a captive animal, in its native forest in the great natural park at Vancouver, partake freely of the foliage of spruce, Douglas fir and juniper, in rapid succession.

Because of some diatetic peculiarity as yet un-

[1] *O-do-coil'e-us co-lum-bi-an'us.*

known, the Columbian Black-Tailed Deer cannot live on the Atlantic coast. After persistent efforts, with at least fifteen specimens drawn from Oregon, Washington and British Columbia, and the loss of all through gastro-enteritis, the New York Zoological Society has abandoned its attempt to transplant the species.

In Alaska, this species dwindles still lower, into the **Sitka Deer,**[1] in stature and antlers even smaller than the Florida white-tail. It is very abundant on Admiralty Island, but as late as 1901 was being slaughtered in great numbers.

Painted by Carl Rungius.

WHITE-TAILED DEER.

The Virginia Deer, or **White-Tailed Deer,**[2] was the first member of the Deer Family met by the early settlers of America when they went hunting along the Atlantic coast. It will also be the last of the large hoofed animals of North America to become extinct. It is a forest animal, but in many portions of the Great Plains region it freely risks its life in the thin fringes of cottonwood timber, quaking-asp and willow brush that border the banks of small rivers and large creeks. Unlike the elk and mule deer, the White-Tail is a great skulker. When hiding, it crouches and carries its head low, and by clinging persistently to the friendly cover of brush or timber, saves itself under circumstances that would be fatal to any high-headed, pen-ground species.

The White-Tailed Deer derives its name from its very long, bushy, wedge-shaped tail, which is snowy-white underneath, and also on the edges. When alarmed and running away, this white brush is held stiffly aloft, and with every stride of the bearer, it sways from side to side, in a startling and highly conspicuous manner. While the peculiar mixed gray color of the pelage makes it difficult to see this animal in brushy surroundings, the moment the creature starts to run, its white flag waves as if purposely inviting bullets, and in total defiance of all the laws of "protective

[1] *O-do-coil'e-us sit-ken'sis.*
[2] *Odocoileus vir-gin-i-an'us.*

coloration" amongst animals. Indeed, so very flag-like is this creature's waving tail that in the West many hunters call it the **Flag-Tailed Deer.**

There are two points in which this deer differs from all others, and by which it can easily be recognized.

1. Its antlers rise a short distance from the forehead, then suddenly *drop forward, with the beam almost horizontal, and from the beam three long, sharp tines rise perpendicularly.* The antlers of nearly all other deer point backward as they rise.

2. *The tail is very long, pointed at the end, bushy near the body, and white underneath, as described above.*

The White-Tailed Deer is the best known of all our hoofed animals except the buffalo, because it is the one most widely distributed, and has been longest known. Generally speaking, it is a United States species, for it inhabits at least a portion of every state and territory save Delaware, Oregon, Nevada, California and Arizona. To-day it is most abundant in the Adirondacks, Maine, Vermont, northern Minnesota and Michigan. Closely related forms of White-Tailed Deer are fairly abundant in Florida, on the Lower Rio Grande, and in northeastern Washington.

As might naturally be expected, this wide distribution, throughout such a diversity of country and variety of available food, has produced such variations in size that several subspecies have been described. Of the latter, the most important is the dwarf **Arizona White-Tailed Deer,** extending from southern Arizona southeastward into Mexico to Latitude 25°. This animal, like the **Florida White-Tailed Deer,** seems to be nothing more than a diminutive race of the more robust northern type, with very small antlers, and the short, scanty pelage which is necessary to the comfort of deer in the tropics.

In such forests as those which cover the Adirondack Mountains of northern New York, where small lakes are numerous, there are three methods of hunting deer.

Hounding deer consists in beating through the forest surrounding a body of water, with a pack of hounds, and chasing the deer until they leap into the water, where they are shot at very short range by men in boats or posted on the shore. It is no credit to anyone, save an invalid or a cripple, to kill a deer in this manner, any more than to kill a buck out of season, whose antlers are in the velvet. Any person, no matter how stupid, can be paddled up to a swimming deer and permitted to blow its head to pieces at short range. Pot-hunters have even been known to catch swimming deer, and cut their throats.

In forests like the Adirondacks, frequented by

TAILS OF AMERICAN DEER.

1. Columbian Black-Tail.
2. Mule Deer.
3. White-Tailed, or Virginia Deer. (Small specimen.)

a great many people, hounding deer never should be permitted; and in the wilderness mentioned it is now prohibited by law. In the West Virginia mountains, the hunters are posted on the runways of the deer, and are obliged to kill them on the run. This requires good judgment and excellent marksmanship, and is legitimate sport.

Jacking or *fire-lighting* is a very picturesque and romantic method of hunting deer, but inasmuch as it gives the game no chance, and calls for very little skill or exertion on the part of the hunter, it is by some considered unsportsmanlike. In the prosecution of this plan the hunter requires a canoe, a skilful paddler, and a good light. With a flaring jack-light held aloft in the bow, the paddler, or guide, sits in the stern of the boat, and noiselessly paddles it through the darkness, around the shores of lake or river. The hunter sits under the light, and waits for its beams to emblazon the eyeballs of deer standing

on the shore, or feeding in shallow water. Often the boat approaches so near a wonder-struck deer that to miss it is almost impossible.

Still-hunting is the true sportsman's method of outwitting deer which for keenness of eye, ear and nose, have, I believe, no superior in the whole Family. One fine old White-Tailed buck killed by fair and square trailing and stalking is equal to two mule deer or three elk. When first alarmed, the mule deer and elk are prone to halt from curiosity, and stare at the hunter for that fatal ten seconds which so often ends with a ringing "bang," and a fatal bullet.

YOUNG WHITE-TAILED DEER.
Showing the conspicuous appearance of the tail when held erect.

But not so the White-Tail. Time after time the trailing still-hunter, stealing forward ever so cautiously, sees ahead of him and far beyond fair rifle shot a sudden flash of white, a pillar of cloud swaying from side to side between the tree-trunks, and the vanishing point of a scurrying White-Tail. This creature knows right well that as a discourager of cervine curiosity, nothing in the world equals a breech-loading rifle. When he hears behind him a rustle of dry leaves, or the snap of a twig, nothing else is so dear to him as space, judiciously distributed between himself and his pursuer. I have sometimes made so bold as to consider myself a fairly good deer-stalker; but I have still-hunted White-Tailed Deer in November, on dry leaves and without snow, when for days and days together I found it utterly impossible to come within fair rifle shot of a buck worth having. At such times, a light snow means a fair chance, and properly evens up the game.

During the summer, while the antlers are in the velvet, the coat of this species is short, thin, and of a bright sandy color, often called "red." In Canada, the Virginia Deer is frequently called the "Red Deer"; but this is a mischievous misnomer, for its use always suggests the red deer of Europe. The red coat is worn about three months, say from May 1 to August 1, and then it rapidly gives place to the beautiful mottled brown-gray suit, so long and thick that the owner looks like quite a different creature, and is fitted to withstand the severest winter weather.

The White-Tailed Deer is one of the most persistent species of the entire Deer Family. Give it suitable ground and full protection, and there is no limit to its increase. On Long Island, where deer hunting is lawful on only four days of each year, the animals are increasing with surprising rapidity.

In the northern portions of its range from Minnesota to the Adirondacks, where it attains its most perfect development, it is next in size to the mule deer, or Rocky Mountain "black-tail," and is really a fine animal. A large buck stands 36 inches high at the shoulders, is 53 inches in length of head and body, its tail is 7 inches long to the end of the vertebrae, and 5 inches more to the end of the hair. A fairly large pair of antlers from central Montana are 23½ inches in length from burr to tip of beam, spread 18 inches, and have 13 points. A heavy Maine buck is reported to have weighed, before being dressed, 278 pounds.

Usually but one fawn is born each year, in May, which at birth is beautifully spotted, stands 15½ inches high, and weighs 4½ pounds.

Let it not be supposed, however, that in the

South the White-Tailed Deer of the North necessarily becomes a small or inferior animal. A collection of more than one hundred pairs of antlers from Texas, recently inspected by the writer, contained a surprisingly high percentage of large and heavy specimens, fully equal in length, spread and weight to the best examples from Montana, Minnesota and Maine.

Wild Game as a Source of Revenue.—All persons who pay state taxes in states or territories inhabited by "big game," and game fishes, will do well to bear in mind that under certain conditions wild-animal life can be made an important and legitimate source of revenue. The United States Supreme Court has decided (Ward *vs.* Race Horse, 163 U. S. 507) that all wild game on unoccupied lands is the property of the state, and that even the national government may not, either by treaty with Indians, or in any other manner save actual sequestration, convey any rights or privileges affecting it adversely.

The states of New York and Maine long since discovered that their wild deer constituted valuable state property, and both entered seriously upon the task of preserving them from the annihilation that everywhere follows swiftly upon the heels of non-protection. New York elected to preserve the great Adirondack wilderness as a free hunting-ground for her citizens. Maine, with perfectly proper thrift, decided that her game should not only pay the cost of its preservation, but also be made for her citizens a legitimate source of annual income. All guides must be licensed by the state, no visitor may hunt without a guide, and every non-resident hunter must procure a license, at a cost of $15. This permits the killing of one deer, but no moose or caribou!

As a result of the game and fish laws of Maine that state becomes every autumn a vast hunting-ground, visited by perhaps ten thousand sportsmen who desire to fish, or to procure deer or grouse in their haunts. The army of recreationists annually expends within that state a total sum which is usually estimated at one *million* dollars, or more.

Remember.—The history of wild-animal abundance is good only for the year from which it is drawn. Killable game is here to-day and gone to-morrow. It will be interesting for young investigators to ascertain how the records of to-day compare with those of 1904.

In appraising the value of North America's game and other kinds of wild life, there are vast and valuable resources that cannot be reckoned up in dollars and cents. We refer to the esthetic value of wild life, unpolluted streams and lakes, growing forests and beautiful natural scenery. At this time it is estimated that in the United States there is an automobile in commission for every 5½ persons, and that about 20,000,000 Americans annually seek recreation and health in the great outdoors.

But the wild life of to-day is not ours to dispose of as we please,—that is, not unless we totally ignore the claims of our children, and ruthlessly destroy their rightful inheritance from the Maker of the world. Neither ethically, morally nor legally have we the slightest right to exterminate any wild-animal species that is not a dangerous and unbearable pest. Even the fur-bearing and food-yielding animals must be preserved, and handed down to our children in shape to carry on indefinitely. This duty is not open to argument.

The Flat-Horned Deer.

The Caribou.—In general terms it may be stated that a caribou (pronounced car'ry-boo) is a wild deer-like animal, which bears a general

REMARKABLE "FREAK" ANTLERS OF WHITE-TAILED DEER.

Total number of points, 78. Originally owned by Albert Friedrich, San Antonio, Texas.

resemblance to the domestic reindeer of Europe. Its antlers are long, branching, partly round and partly palmated. Considered as a whole, caribou occupy the upper half of the continent of North America, over which they are widely scattered above the 45th parallel of Latitude.

Next to the musk-ox, the caribou is the most northerly of all hoofed animals. It is not only at home on the vast arctic waste above Great Slave Lake, known as the Barren Grounds, but it ranges on northeastward through Ellesmere Land, crosses to the west coast of Greenland, swings around the northern rim of that island, along the edge of the great ice cap, and down the eastern coast, at least as far as Liverpool Bay, Latitude 70°. Doubtless it inhabits the whole coast of Greenland, wherever the naked ridges and valleys of the terminal moraines yield a supply of food: but there is no evidence that it wanders over the vast sheet of lifeless inland ice which covers the interior of Greenland.

At all times, a caribou is an odd-looking creature. Even a very brief inspection is sufficient to reveal the special provisions which Nature has made to enable it to brave the terrors of an arctic climate. The legs are thick and strong, and the hoof is expanded and flattened until it forms a very good snow-shoe. The caribou walks over snow-fields and quaking muskegs, when the moose sinks in and ploughs through them.

Its pelage consists of a thick, closely-matted coat of fine, wool-like hair, through which grows the coarse hair of the rain-coat. It is the warmest covering to be found on any hoofed animal except the musk-ox, or on any animal of the Deer Family. To the touch, the new coat of a caribou feels like a thick felt mat.

The natural food of the caribou is moss and lichens, and in captivity very few survive many months without the former. The supply of moss for the caribou and reindeer of the New York Zoological Park comes from Maine, and costs in that state seventy-five cents per hundred pounds. A full-grown woodland caribou consumes about seven pounds daily.

Although up to this date nine species of caribou have been described, there are but two well-defined groups, the woodland and Barren Ground. In each of these, several species have been described, but it must be admitted that so effectually do they run together it is not always an easy matter to distinguish them.

In common with many members of the Deer Family, caribou are distinguished chiefly by their antlers. But even here, great difficulties are encountered. With their many tines and points, varying size and forms of palmation, their antlers are subject to thousands of variations. As a result, no two pairs ever are found exactly alike. Between the very long, few-pointed and scarcely palmated antlers of the Greenland caribou, and the short, many-pointed and widely palmated antlers of the mountain caribou, every conceivable form may be found.

If ten pairs of adult antlers of each so-called species were collected in its type locality, and the whole ninety mixed in one heap, the utmost that even an expert could hope to accomplish without a heavy percentage of error would be to separate the collection into two groups, one containing the four species of Barren Ground caribou, the other the five woodland species.

It is useless to enter here into details regarding each of these nine tentative species. Without a very large collection of specimens, and prolonged study of them, it is impossible to define the boundaries between the various species that have been proposed. Let it suffice to present a brief outline of the two great groups into which all our caribou seem to be rationally divisible.

The Woodland Caribou Group.

Roaming through the pine and spruce forests, and also the prairies of Newfoundland, Nova Scotia, New Brunswick, northern Maine, Quebec, Ontario and Manitoba, are the caribou longest and best known to us. A typical specimen[1] living in the Zoological Park is a strong lusty animal, 48 inches high at the shoulders, weighing 280 pounds, and endowed with sufficient energy to vanquish the strongest man in about one minute. Its shoulders are high and sharp, its head is held low and thrust straight forward, and as it walks on hard ground its dew-claws and hoofs click like castanets. Its head is long and cow-like, and its muzzle is too large for beauty; but the large, liquid, dark brown eyes appeal successfully against all adverse decisions on questions of beauty.

[1] *Ran'gi-fer car'i-bou*, from Maine.

When a caribou walks, its long stride and swinging gait proclaim a born traveller and migrant. And truly, the strangest of all caribou habits is that which impels these creatures, particularly the Barren Ground species, to assemble in immense throngs, and for climatic reasons migrate *en masse*, for long distances. In the woodland species, however, this habit is not nearly so pronounced.

Character of Antlers.—A comparison of many antlers of Woodland caribou with those of Barren Ground animals reveals one or two points of difference which seem sufficiently distinct to be accepted as constant.

1. Antlers of Woodland caribou, generally, *are short in the main beam, liberally palmated both on brow-tines and tips, and have more than thirty points. As a whole, the antlers have a tree-top appearance.*

2. Antlers of Barren Ground caribou, generally, *are long in the main beam, scantily palmated, especially on the tips, and have less than thirty points. As a whole, the antlers have an arm-chair appearance.*

If these distinctions between the two great groups of caribou will not hold good, none will.

It is perfectly obvious that with all its ability as a migrant and long-distance traveller, all the caribou and reindeer of the world were intended by Nature to inhabit only the arctic and near-arctic regions of the Northern Hemisphere.

In North America, generally speaking, the whole tribe stopped short at or very near the northern boundary of the United States. It is of no use whatever to attempt to cajole or compel these strangely fashioned animals to live and thrive in the United States, below the Canadian boundary. Even the more northerly musk-ox fares better in New York City than either caribou or reindeer.

From a photograph by F. C. Havemeyer.

OSBORN CARIBOU.

In the open country of the North, where their favorite food is plentiful and cheap, caribou are easily seen, and easily killed by modern long-range rifles of great power and accuracy.

The Woodland Caribou of Maine, Ontario, and Quebec (*Rangifer caribou*), is the original type of what recently has become a group of species. Its body color is bluish-brown and

gray, which color also suffuses the neck, head and hind-quarters. In October the new coat is of a dark color known as seal brown, quite different from the same pelage in spring.

Originally the **Newfoundland Caribou** were referred to the species named above, but in 1896 they were given rank as an independent species (*R. terraenovae*) chiefly on account of their very light color. They are the whitest of all caribou.

In 1899, Mr. Ernest Thompson Seton described

ANTLERS OF KENAI CARIBOU.

From photograph of specimen taken on the Kenai Peninsula by HARRY E. LEE.

the **Black-Faced Caribou** of southeastern British Columbia (Revelstoke) as *Rangifer montanus*, or **Mountain Caribou.** The new September coat is almost black. The antlers are short, but throw off a surprising array of long tines.

In 1902 the large, dark-colored caribou of the Cassiar Mountains, in northern British Columbia, was described by Dr. J. A. Allen as **Osborn's Caribou** (*Rangifer osborni*), the name bestowed being in honor of Professor Henry Fairfield Osborn, the distinguished zoologist of the American Museum of Natural History. This species attains a shoulder height of 55 inches, and is said to be the largest of all caribou. In September its coat is so brown the animal has been described as a brown caribou.

The Kenai Caribou of the Kenai Peninsula—but, in 1903 almost extinct in that locality—was described in 1901 as a distinct species, and christened *Rangifer stonei*. In September, 1903, the Secretary of Agriculture issued an order prohibiting for five years the killing of caribou on the Kenai and Alaska Peninsulas.

Regarding the distribution and habits of caribou in the Canadian Northwest, Mr. J. B. Tyrrell, who, while a member of the Canadian Geological Survey, travelled over a greater area of the range of that animal than any other observer known to me, has kindly furnished the very interesting facts quoted below. His letter is dated at Dawson City, September 10, 1903.

"Regarding the portions of the districts of Alberta, Athabasca and Saskatchewan spoken of by you, I am reasonably certain that the Woodland Caribou may be found in all the thickly wooded tracts. This deer is known to the Cree Indians of that country as the 'Muskeg-Atik,' or Swamp Deer, in recognition of the fact that it lives in the swamps and coniferous forests, and not on the plains, or on the country studded with groves of poplar. Now, much of Alberta, and a great part of Saskatchewan, is dry, open country, and into such country caribou rarely wander.

"This dry, 'bluffy' country extends northwestward through the western part of Athabasca, but throughout all the *thickly wooded* parts of Athabasca I have no hesitation in saying that Woodland Caribou are not uncommon. They certainly occur along the Churchill River, and I think that their tracks were common along the banks of the Athabasca River, though I cannot definitely remember this, and I have not my note-books here to help me.

"The Indians told me that the Woodland Caribou of the Churchill River and vicinity move northward, and the Barren-Ground Caribou southward in autumn, and that both winter in the same region, in a country where the trees are festooned by a long, black, hair-like lichen (*Alectoria jubata?*). However, I believe that the

Woodland Caribou are not numerous anywhere in the Canadian Northwest Territories, for in all my travels for the Geological Survey of Canada, extending over the period from 1883 to 1898, I did not see a dozen of those animals, though on hundreds of different occasions I saw their great wide-spreading tracks. The only one I ever shot was feeding on a rocky hill, beside a stream that flows into the east side of Lake Winnipeg; and his head is now hanging in the Museum of the Geological Survey, in Ottawa.

"The smaller species of Caribou lives on the Barren Grounds during the summer. On the approach of winter most of the animals migrate southward to the edge of the forest, though some remain throughout the winter on the open barrens.

"Twice, in 1893 and 1894, I met what is known as 'the herd,' on its way southward, once on a good feeding ground, where hundreds of thousands were collected together, and again on a rough, rocky tract where the individual bands rarely exceeded a few hundred in number, and all were on the run."

ANTLERS OF GREENLAND CARIBOU (*R. groenlandicus*).

Showing the form characteristic of the Barren Ground Caribou group. Specimen from the northwest coast of Greenland.

Barren Ground Caribou Group.

Throughout a vast and very hungry sweep of northlands, the **Barren Ground Caribou**[1] long has been, and still is, an animal of leading interest and value. To many Indian tribes, such as the Dog-Ribs and Yellow Knives, and to many of the Eskimo tribes also, it has been an important source of subsistence, both in food and clothing. It is so peculiarly a creature of treeless and inhospitable regions, and is so independent of the conditions which are essential to the existence of all round-horned members of the Deer Family, that its desolate home has been inseparably connected with its popular name. Species may come, and species may go, but we hope that the brave and hardy Barren Ground Caribou will go on forever.

It is natural that in any animal species which ranges from the east coast of Greenland to the west coast of Alaska (3,500 miles in an air line), and from Grant Land to the Churchill River (1,800 miles), some variations in form, color and horn architecture should occur. Indeed, in a range so immense, it could scarcely be otherwise. While it is probable that some of these variations justify the creation of specific divisions, we are at present less concerned with these details than with a consideration of the group as a whole. Moreover, it may be said with entire truth that naturalists have but recently begun to study the caribou of America; and until far more material has been gathered, it is impossible to set forth the true status and life history of this genus.

The characters which serve to distinguish

[1] *Ran'gi-fer arc'ti-cus.*

Barren Ground Caribou from the woodland groups have already been pointed out,—smaller size, antlers that are longer in the main beam, less palmated and with fewer points. The following forms have been described as independent species of this group; but whether all of them are entitled to specific rank remains to be seen.

Barren Ground Caribou Species.

Greenland Caribou, *Rangifer groen-land'i-cus*, Greenland Coast.

Barren Ground Caribou, *Rangifer arc'ti-cus*, Canadian Barren Grounds.

Grant's Caribou, *Rangifer granti*, Alaska Peninsula.

Peary's Caribou, *Rangifer pearyi*, Ellesmere Land.

In view of the tens of thousands of Barren Ground Caribou that have been seen by white men, and the thousands that have been killed by and for them, the scarcity of definite observations upon this group, and of preserved specimens is, as a whole, very unsatisfactory. At present, therefore, the many undetermined questions regarding the component parts of the group render it impossible to do much more than to define the assemblage as a whole.

In general terms it may be said that the average Barren Ground Caribou is a close under-study of the average reindeer of Siberia and Lapland, and also a smaller animal. That all our caribou have descended from the reindeer of Asia, and came to us by crossing Bering Strait on the ice, seems more than probable.

In surveyor's parlance, the head of Cook Inlet is the "point of departure" of the woodland caribou from the reindeer—Barren Ground type. It would be difficult to find on land a clearer or sharper line of cleavage between two groups of animals than that between *Rangifer granti* of the Alaska Peninsula, and *Rangifer stonei* of the Kenai Peninsula. One moment's examination of the types is sufficient to place those species in their respective groups. The antlers of the Kenai caribou are massive, with many long tines on the terminal half of the main beam. They have 36 points, and a tree-top effect when seen from the front. Grant's caribou, however, has a long and naked main beam running up to a terminal bunch of short tines, a wide-open, arm-chair appearance, and only twenty-seven points, all strongly characteristic of the Barren Ground type. The superior size of the Kenai caribou is confirmatory of the testimony of the antlers of both.

Geographic Range.—The centre of abundance of the Barren Ground Caribou group is midway between the eastern end of Great Slave Lake and the southeastern extremity of Great Bear Lake. This, however, is not the geographic centre of its distribution. The great semi-annual migration is about on a line that might be drawn between Cape Bathurst and the eastern extremity of Great Slave Lake, and undoubtedly the great mass of caribou on the mainland east of the Mackenzie assemble along that route.

Another line of migration, also from northwest to southeast, passes eastward of Dawson City, and sufficiently near it that great numbers of caribou carcasses have been sledded in to the meat markets of that city. In 1901 a search of those markets revealed 5,225 pounds of moose and caribou meat on hand at one time. Along the arctic coast between Point Barrow and the mouth of the Mackenzie, tens of thousands of caribou have been killed by natives, and sold to whaling ships wintering along that coast. As a natural consequence, the herds have nearly disappeared from that locality.

Up to the time that Alaska was purchased by the United States, the natives had few firearms, or none at all, and caribou were abundant. Along the west coast, caribou once were so numerous that a cannon from the fort at St. Michael was fired at a herd that passed within half a mile of the settlement. As usual, we immediately supplied the natives with firearms and ammunition; and as a first result, the only caribou now remaining in western Alaska are the few stragglers that the hunters have not yet overtaken. A few herds of Grant's caribou still inhabit the treeless wastes of the Alaskan Peninsula, but on the Kenai Peninsula, the caribou is now believed to be almost extinct. In 1903 it was estimated that only thirty individuals remained alive.

The great herd seen by Mr. Tyrrell at Carey Lake, west of Hudson Bay, will be mentioned in detail later on. On the Labrador Peninsula, there are said to be three distinct herds, on Hudson Straits, Ungava Bay, and the Atlantic coast

down to Hamilton Inlet. From Ellesmere Land, five skins of a white animal with a gray back have been described as **Peary's Caribou,**[1] and from at least four points in Ellesmere Land, Caribou have been reported.

Along the northwest coast of Greenland, especially between Melville Bay and Kane Basin, Commander Peary found a fair abundance of caribou, and at Liverpool Bay, on the east coast, a number were killed by a Danish expedition, in 1900.

Habits.—One of the habits of the Barren Ground Caribou is particularly striking. At stated periods, in spring and autumn, they assemble in immense herds, and migrate *en masse* with the compactness and definiteness of purpose of an army of cavalry on a march. This is most noticeable on the Canadian Barren Grounds, which by reason of its summer pasturage and the absence of water barriers, encourages the display of natural instinct. The observations of several travellers north of the Great Slave Lake have resulted in the belief that "in spring the Barren Ground Caribou seek the coast of the Arctic Ocean, and remain near the salt water until about September." But this idea is much too circumscribed.

The explorations of Mr. J. B. Tyrrell, of the Canadian Geological Survey, have proved conclusively that the universal herd of the Great Slave Lake region does exactly as did the universal buffalo herd of 1871. It moves northward in spring for a given distance only, stops at will, spends the summer, and in the early winter moves southward. On July 30, 1893, Mr. Tyrrell saw a vast assemblage of Barren Ground Caribou at Carey Lake (Latitude 62° 10′ and Longitude 102° 45′), nearly 500 miles from the Arctic coast. A herd of several thousand animals was composed of females with young fawns, young females and males of all ages, the lofty antlers of the latter being noticeably prominent. This herd was then only sixty miles north of the southern edge of the Barren Grounds.

The most impressive published description of a caribou migration is from the pen of Mr. Warburton Pike. It is a relation of what he saw on Lake Camsell, sixty miles north of the eastern end of Great Slave Lake, in 1889, and refers to the southward movement to the timbered regions, where the lichens growing upon the trees afford subsistence in winter when the ground mosses are buried under snow and ice.

"From what I could gather from the Yellow-Knife Indians," says Mr. Pike in "The Barren Grounds of Northern Canada," "and from my own personal experience, it is late in October that the great bands of Caribou, commonly known as *La foule*, mass upon the edge of the woods, and start for the food and shelter afforded by the stronger growth of pine farther southward.

"Scattered bands of Caribou were almost always in sight from the top of the ridge behind the camps, and increased in numbers till the morning of October 20, when little Baptiste, who had gone for firewood, woke us before daylight with the cry, '*La foule! La foule!*' (The throng.) Even in the lodge we could hear the curious clatter made by a band of travelling Caribou. *La foule* had really come, and during its passage of six days, I was able to realize what an extraordinary number of these animals still roam the Barren Grounds.

"From the ridge we had a splendid view of the migration. All the south side of Mackay Lake was alive with the moving beasts, while the ice seemed to be dotted all over with black islands, and still away on the north shore, with the aid of the glasses, we could see them coming like regiments on the march. In every direction we could hear the grunting noise that the Caribou always makes when travelling.

"The snow was broken into broad roads, and I found it useless to try to estimate the number that passed within a few miles of our encampment. We were just in the western edge of their passage, and afterward we heard that a band of Dog-Ribs, hunting some forty miles to the west, were at this very time in the last straits of starvation, only saving their lives by a hasty retreat to the woods. This is a common danger in the autumn, as the Caribou, coming in from the Barren Grounds, join together in one vast herd, and do not scatter much till they reach the thick timber.

"The Caribou, as is usually the case when they are in large numbers, were very tame, and on several occasions I found myself right in the middle of a band, with a splendid chance to pick out any that seemed in good condition. . . .

[1] *Rangifer pearyi.*

Notwithstanding all the tall stories that are told of their numbers [the buffaloes], I cannot believe that the herds on the prairie ever surpassed in size *La foule* of the Caribou."

Size and Antlers.—At present the size of the Barren Ground Caribou appears to be a matter of opinion rather than of observation and record. In the hope that some one will come forward and disprove it, I venture to make the assertion that no one ever has weighed a whole, full-grown male specimen. We have a few figures of "dressed" weight, and various "abouts," but really useful facts are lacking. It is currently believed that the Barren Ground Caribou of northern Canada is about one-third lighter than the woodland species of Ontario and Quebec. If this be true, and we may judge by our own woodland bull, which unquestionably was a large one (48 inches high, weight, 261 pounds), then the male Barren Ground animal may be set down as weighing 174 pounds. For the Greenland caribou and Grant's caribou, this weight surely is too low; for the skulls and skins of both those species indicate a greater weight. On the Alaska Peninsula Mr. C. H. Townsend weighed a dressed specimen of *Rangifer granti* and estimated very carefully the weight of the viscera, with the conclusion that the live weight of the animal was 410 pounds.

For their body size, Barren Ground Caribou have very large antlers. They sweep back so far, rise so high and spread so widely that they have the effect of magnifying the height and bulk of the wearer. As will be seen by the following measurements, the antlers of the Barren Ground species are longer than those of the woodland, but with fewer points, and in most cases less palmation. In the series of plates of all species published by Mr. Madison Grant in his valuable paper on "The Caribou" (Report of the New York Zoological Society, 1902), one of the most striking differences between the two groups is the tree-top appearance of all woodland antlers, and the open, arm-chair effect of the Barren Ground types.

The Disappearance of Caribou.—It was only a few years ago that there was caribou hunting in Maine, New Hampshire, Vermont, Michigan, Minnesota, Montana, Idaho, and Washington. To-day (1927) in all those states caribou hunting is a dead sport, because the caribou are gone —and hunting extinct caribou is forbidden by law!

In 1904 the caribou species inhabiting eastern Alaska and the Barren Grounds of Canada as far eastward as the west shore of Hudson Bay were to be estimated in millions, and regarded as the most numerous land animals of any genus then inhabiting the earth. Northward of the mainland of Canada the caribou population always has been small, badly scattered, and easy to be exterminated by natives armed with modern rifles.

And how has fared the game of the continental mainland caribou region?

The rifles of white men and natives are "cleaning it up." In the first place, the whalers of the Arctic Ocean, hunting inland for game meat, soon desolated a strip about thirty miles wide along the Arctic coast.

The sportsmen and residents of the Kenai Peninsula promptly exterminated on that penin-

MEASUREMENTS OF CARIBOU ANTLERS.

IN THE NATIONAL COLLECTION OF HEADS AND HORNS, NEW YORK ZOOLOGICAL PARK.

All measurements in inches.

			LENGTH OF MAIN BEAM.	WIDEST SPREAD.	POINTS.	DONOR.
GREENLAND,	*R. groenlandicus*,	W. Greenland,	52	41½	21	The Author.
BARREN GROUND,	*R. arcticus*,	N. Labrador,	52½	41¾	44	Hesketh Prichard.
GRANT'S,	*R. granti*,	Alaska Peninsula,	62	50	24	Emerson McMillin.
NEWFOUNDLAND,	*R. terraenovae*,	Newfoundland,	41	36	36	Madison Grant.
WOODLAND,	*R. caribou*,	Maine,	39⅝	30⅛	33	F. Burton Harrison.
MOUNTAIN,	*R. montanus*,	S. Brit. Columbia,	40⅛	25⅝	26	J. M. Holzworth.
OSBORN'S,	*R. osborni*,	W. Yukon Terr.,	62¼	43¼	34	F. C. Havemeyer.
KENAI,	*R. stonei*,	Kenai Peninsula,	58¼	39½	40	The Author.

sula the big Kenai Caribou that deserved a better fate. Mr. Edward I. Garrett, of Seattle, after a recent hunting experience in the Kenai Peninsula, reported thus: "When I hunted on the Kenai in the fall of 1924, there were no Caribou there, and none had been seen for a long time. I have not heard of any appearing in that part of Alaska since I was there, and I doubt if there are any."

Whether any Kenai Caribou remain unkilled on the mainland remains to be seen; but we hope that fine species is not yet totally extinct.

It is yet an open question whether the great caribou herds of the eastern Barren Grounds of Canada can breed as rapidly as the rifle-bearing Indians and Eskimos can slaughter them, for their meat and hides. On that point the late Dr. C. Gordon Hewitt was greatly alarmed. The following is from his book, "The Conservation of the Wild Life of Canada" (Scribners, 1921, p. 65).

"The increase in the number of rifles supplied to the Eskimos on the Arctic coast has resulted in a great increase in the number of caribou killed. At the same time, the ability to obtain this form of food so easily has led to a change in the habits of the Eskimos. Formerly they usually hunted seal during the winter, and continued until late in May. Now, Doctor R. M. Anderson informs me, they are coming ashore one or two months earlier than was their former custom, and living on the caribou, which are migrating steadily northward in April and May. While they are migrating they are most easily killed. But the worst feature of this spring killing, which of course is illegal, is that most of the caribou killed are females which are crossing to Victoria Island to give birth to fawns in June. It is of the greatest importance to the conservation of the caribou that this practice should be stopped, and recommendations to that effect have already been made in my memoranda and addresses to the Commission of Conservation.

"The wholesale trading in caribou skins must be checked. The extermination of the caribou in northern and northwestern Alaska was brought about by the trade in summer skins, and the sale of meat to whalers. In this region some of the Eskimo hunters used to kill as many as 500 caribou in a single summer for their skins; and the carcasses were usually left to rot. This practice is becoming common in Canadian territory, where skins are taken for the purpose of barter, and the result is that many more skins are taken than are required by the Eskimos for their personal use. Unless this wasteful practice is discontinued—and we hope it will be—any other effort to conserve the caribou will have little effect. It is interesting to note that some of the Eskimo tribes entertain the belief that the caribou are sent to them by the spirit world to kill, and that unless they kill every caribou they meet, whether they require it or not for food or clothing, the spirit world will not send them any more. Such a belief naturally leads to wasteful slaughter on the part of the Eskimos, and it is to be hoped that missionaries and others will endeavor to dispel such a pernicious idea."

Reindeer.—In America it is the domesticated Reindeer of Alaska—now totaling about 300,000 and diligently seeking United States markets—that is most in the public eye. But the domestic animal is not all in all. There are yet wild Reindeer in northern Europe, and Sigvald Salvesen, of Arendal, Norway, reports that in Norway alone in 1925 there were killed 444 Reindeer, 347 in 1924, 494 in 1923, and 672 in 1922. In those same years, European Moose (Elch) were killed in Norway as follows: 1,186, 870, 732, and 307; and nearly one-half of them were females!

The Moose[1] is the largest animal of the Deer Family, living or extinct. Even the Irish elk, with antlers which, in at least one specimen, spread 9 feet 3 inches, was a smaller animal. It is a satisfaction to know that the most colossal deer that ever trod the earth is alive to-day, and an inhabitant of our continent.

Imagine, if you can, an antlered animal standing between six and seven feet high at the shoulders, its legs quite four feet long, its neck and body covered with a heavy thatch of coarse, purplish-gray hair from three to six inches long, and its huge head crowned with massive antlers spreading from five to six feet in width. Its head is among the lower branches of the forest, and its long legs stride with indifferent ease over fallen tree-trunks which to the hunter are barriers to be climbed over, slowly and laboriously.

The Moose can instantly be recognized by its

[1] *Al'ces americanus.* Called in Europe, the "Elk"; and our Elk is there called the "Wap'i-ti." See Frontispiece.

broad, square-ended, overhanging nose, large ears, high hump on the shoulders, and long, coarse, smoky-gray hair. The adult male is further distinguished by antlers that are enormously flattened and expanded, in a form popularly known as "palmation."

The Moose is not a grazing animal, like the elk and most other members of the Deer Family. It lives by "browsing," or eating the bark, twigs and leaves of certain trees, and also moss and lichens. It is strictly a forest animal, and is never found on open, treeless plains. It is very fond of still water, and is much given to frequenting the small lakes and ponds which abound in some portions of its home. It is as fond of wading in shallow water as a boy, and is a ready and powerful swimmer. It loves to feed upon lily pads and stems, and moose hunters have assured me that it even seeks the bulbs growing in the muddy bottom.

Except in Alaska, the majority of Moose killed by hunters are shot from ambush beside ponds, or from canoes. Frequently Moose that are surprised when wading and feeding in shallow water, make the mistake of rushing into deep water, to escape by swimming, when they are easily overtaken, and either killed, captured, or photographed.

The cry of this animal is a prolonged, resonant bawl, ending in three or four hoarse grunts.

The accompanying map shows that the Moose is yet found in northern Maine, New Brunswick, Canada, Manitoba, northern Minnesota, northwestern Wyoming, Idaho, British Columbia, Alberta, Athabasca, Yukon and Alaska. It shows only localities known to have been inhabited in 1902. In none of these, however, are Moose so abundant as in Alaska, around Cook Inlet. The southern limit of the Moose in North America is the head of Green River, Wyoming, Latitude 43°, Longitude 110° W., corresponding to the latitude of Albany, New York.

Below Alaska, the favorite hunting-grounds for Moose are Maine, New Brunswick, the upper Ottawa River country of Canada, and northwestern Manitoba.

The young of the Moose—always spoken of as a "calf," its mother being called a "cow"—is born in May, and at first is a very grotesque-looking creature. Its enormously long, loose-jointed legs are attached to an abnormally short and diminutive body. The neck is so short the creature cannot put its nose to the ground without kneeling. Its hair is woolly and brick red, or "sandy," like that of a buffalo calf.

A Moose calf which I once owned, and measured when seven weeks old, had the following dimensions:

Height at shoulders	37 inches.
" " hips	31 "
Length of head and body	42 "
Depth of chest	11 "
Length of foreleg to elbow	26 "
Weight	79 pounds.

At one year of age, if not stunted in growth, a Moose stands from 4 feet 9 inches to 5 feet in height at the shoulders, where it has developed a lofty hump. On August 14, 1901, the largest of six Moose in the New York Zoological Park, each one about fifteen months old, measured as follows:

Height, 5 feet 3 inches; length, head and body, 5 feet 9 inches. Length of tail, 3½ inches; depth of chest, 2 feet 2 inches. Horns, 4 inches long; weight, 330 pounds.

Any Moose which stands 6 feet 6 inches in height at the shoulders may be considered a very large one, a prize, in fact. The largest Moose of which I have a reliable record, was killed in New Brunswick, in 1901, by Carl Rungius, the justly-celebrated animal painter, and carefully measured by him with the following result:

Height of shoulders, 7 feet, exactly.
Length of head and body, 9 feet 7 inches.
Girth, 8 feet.
Length of head alone, 2 feet 9 inches.
Antlers small for so large an animal.

The largest antlers recorded up to this date (1903) came from the Kenai Peninsula, are now in the Field Columbian Museum, and have the following dimensions:

Spread at widest point, 78½ inches.
Greatest width of palmation, 16 inches.
Circumference of burr, 15 inches.
Greatest thickness of palmation, 2⅛ inches.
Length of skull, 28¾ inches.
Total number of points, 34.
Weight of antlers and dry skull, 93¼ pounds.

From the above figures, one can imagine the strength necessary to enable an animal to carry such an unwieldy load upon its head, and run at great speed for long distances over the roughest kind of timbered country.

Regarding the weight of adult Moose, very few exact observations have been recorded, or otherwise made available. A large Maine Moose killed by W. L. Miller of Bangor, weighed 1,123 pounds. A dressed carcass weighed by S. L. Crosby showed a weight of 1,009 pounds. (*Recreation Magazine*, IV, p. 89.)

By the time a Moose calf is a year old, it has taken on the colors of adult life, which consist of a mixture of blackish-brown on the head, neck and body, and yellowish-gray on the legs and under parts. The hair and mane is long, coarse and stiff, and lies more like a thatch of straw than genuine hair. On the neck and shoulders it is six inches long. Under the throat hangs a long, ornamental strip of hair-covered skin, four inches long, called a "bell." In the adult male animal this bell is sometimes a foot in length.

The female Moose has no antlers, but in bulk she almost equals the proportions of the male. Out of every thousand females, only one has a "bell."

In captivity the Moose is naturally a docile animal, not foolishly nervous like most deer, but steady, confiding and affectionate. Moose are easily handled, and trained to drive in harness, and in contact with man manifest more common-sense than any other species of deer with which I am acquainted.

Owing to the peculiar nature of the digestive organs of this animal, it cannot live long upon ordinary grass or hay, even when supplemented with the best tree-branches that its own native forests can supply. It is my belief that vigorous daily exercise is vitally necessary to the proper digestion and assimilation of their food. In captivity, even when fed on fresh green browse of the choicest variety, which they eat with relish, they usually die of gastro-enteritis, or inflammation of the stomach and intestines. Green grass is fatal to them, and when fed on grain, hay and vegetables they soon become emaciated and die. Thus far the best results achieved in the maintenance of captive Moose on public exhibition have been in the Cincinnati Zoological Garden, where Superintendent S. A. Stephan has succeeded in keeping a pair for about five years. In great forest preserves, such as Blue Mountain Park, in New Hampshire, Moose do live, thrive and increase.

DISTRIBUTION OF THE MOOSE IN NORTH AMERICA.

walking astride of them, and "riding them down," and in the manipulation of small branches, the use of the overhanging and prehensile nose is strikingly apparent. With their strong lower front teeth, used chisel-fashion, they gouge the bark off large branches, and feed upon it. In grazing on grass, or feeding upon ground mosses, a Moose must kneel in order to reach them.

During the deep snows of winter, Moose herd together in sheltered spots in the forest; and

Copyright by Dall DeWeese.

ANTLERS OF AN ALASKAN MOOSE.

Spread, 68 inches. From an animal killed on the Kenai Peninsula, by Dall DeWeese.

through their moving about in a small area, the snow is trodden down until they form what is called a "Moose yard."

Naturally, because of its grand proportions, and its massive antlers, the Moose has been to every hunter of big game a grand prize. Although difficult to find and approach within easy rifle-shot, when approached it is killed easily and without danger. During the past five years, this species has been fairly protected throughout the eastern half of its range, and in 1902 this protection was by Act of Congress extended over the whole of Alaska. Without real protection, ten years' time surely would see this magnificent animal, which Nature has been millions of years in bringing to perfection as we now see it, practically exterminated throughout North America.

In the United States, the Moose has shared the fate of the caribou, mountain sheep and white goat. It has been "shot out" in Maine, New Hampshire, Vermont, Michigan, Wisconsin, Montana, Minnesota, Idaho, Washington, and Oregon until it has reached the verge of the precipice. Naturally, all Moose hunting in those states has been stopped, except intermittent and brief killings in Maine and Wyoming. Naturally, the pressure for "an open season on Moose" is constant.

The Moose of Wyoming, of which the majority are permanent residents of the southwestern corner of the Yellowstone Park, have under protection increased somewhat, and now they are constantly menaced by the sportsmen of Wyoming. Twice already (up to 1927) the State Game Commission has authorized the issue of hunting licenses for the killing of 50 Moose per year.

It is to be hoped that the time will come when Moose will be sufficiently dispersed throughout the Yellowstone Park that visitors occasionally may see living wild specimens of this fast-vanishing species.

The Alaskan Moose has obtained a place in the annals of natural history to which its title is, at the least, very questionable. It has been described as a new species (*Alces gigas*), and a giant besides; and because of this, and its really immense antlers, it has dwarfed prevailing ideas regarding the more southern species (*A. americanus*).

For the exaggerated ideas of this animal that now quite generally prevail, its antlers are perhaps chiefly responsible. Occasionally they are of great size and weight, exhibiting enormous spread (from 70 to 78 inches), wide palmations and also great thickness (from 1½ to 2 inches). Their maximum dimensions considerably surpass those of antlers from more southern individuals. In addition to all this, they occasionally show freaky development in the shape and set of the brow antlers; and occasionally the main shovel throws out a palmated spur of striking form and size. Seen from the front, it often happens that the antlers of an Alaskan Moose present a chaotic

jumble of tines and palmations. Occasionally these odd forms are also found among the moose of Ottawa and New Brunswick.

But in Alaskan Moose antlers, freaky development is exceptional, and the real type is the same as that found on the moose of Nova Scotia, Manitoba and Minnesota. The largest antlers on record up to this date are perfectly regular. Apparently the Alaskan Moose find in summer an abundant supply of some food which is particularly rich in horn-producing properties, and their enormous and freaky antlers are the result.

Regarding the size of Alaskan and other moose, it is well to weigh the best available evidence.

So far as I am informed, the largest moose ever killed and measured by thoroughly experienced and reliable hands is the one already referred to which was shot in New Brunswick by Mr. Carl Rungius, the painter of American animals, whose knowledge of the external anatomy of that animal is, as many believe, second to that of no other man. The accuracy and fairness of Mr. Rungius' measurements of the animals he has so long studied in their wild haunts, is beyond question. According to Mr. Rungius, the moose referred to above stood precisely 84 inches high at shoulders, and had a girth of 96 inches; but "for so large an animal its antlers were rather small."

The following measurements of moose, in inches, are of interest in determining the real value of prevailing impressions regarding the Alaskan animal, and its right to specific rank by reason of its great size:

BY WHOM SHOT AND MEASURED.	LOCALITY.	SEX.	HEIGHT AT SHOULDERS.	GIRTH.	LENGTH OF HEAD AND BODY.
Carl Rungius, . . .	New Brunswick,[1] . .	Male	84	96	115
Dall DeWeese, . . .	Alaska,[2]	Male	80¾	91¾	119¾
L. L. Dyche, ...	Minnesota,[1]	Male	78½		

Until the enactment of the national law of 1902 for the preservation of wild animal life in Alaska, the huge antlers of the moose of Alaska threatened to cause the annihilation of the species in that territory. "Record heads" and "record antlers" began to be sought for by those who were able to buy them at high prices, and very promptly moose-killing for heads and horns became an established industry. The unfortunate fact that in many portions of southwestern Alaska Moose were easily found and killed, bore heavily against them. The Kenai Peninsula partook of the character of a moose "preserve," in everything save preservation.

In 1902, through the combined efforts of naturalists and sportsmen, Congress enacted a law for the protection of the wild animals of Alaska, very wisely charged the Secretary of Agriculture with its enforcement, and vested him with wide discretionary power.

For about fifteen years the game regulations then established for Alaska produced good results. After that there developed a degree of unrest and lawlessness that became very harmful to the game of Alaska, and to the people of that territory. In 1924 Congress enacted a new Game Act for Alaska, making new provisions calculated to produce satisfactory conditions. A five-unit Game Commission was created, with some discretionary power designed to meet from year to year the changing conditions that might arise. It is the duty of the Commission to see to it that the game laws, and the regulations having all the force of law, are reasonably enforced.

One cause for future anxiety is the special hunting rights accorded to natives, both Indians and Eskimos, and the reasonable certainty that they will too abundantly supply themselves with the most modern and deadly long-range rifles, and kill moose and other big game too persistently and wastefully.

THE PECCARY FAMILY.

Tayassuidae.

The wild swine of the world form a group which contains several remarkable forms.

The wart hog, of Africa, is the ugliest of all land animals, and its head is of such a remarkable form that at first sight it seems like one of

[1] *Alces americanus.* [2] Largest of several very large male specimens collected on the Kenai Peninsula.

the sports of nature. The red river-hog, of West Africa, is the most beautiful of all swine, and its immaculate red coat, and long, slender ears produced to infinity in the form of a waving pencil of threadlike hairs, renders this animal acceptable in any zoological garden.

The Collared Peccary is our nearest and best-known representative of the wild swine. Its northern limit is the Red River, and the valley of the Rio Grande, in Texas, and southward it ranges to Patagonia. In northwestern Sonora, it has recently been obtained by Dr. D. T. MacDougall in regions so dry, hot and barren of vegetation that it was a surprise to find it there. Its preference is for brushy, upland jungles, but

COLLARED PECCARY.

at the same time it frequents all available cover, from the fruitful hard-wood forests of Arkansas and Texas to the moist and hot jungles of Central and South America.

In Texas this animal is called the **"Javelina,"** and hunting it on horseback with dogs is a sport not to be despised. When hotly pursued, the Peccary of Texas gladly dives into any rocky crevice or hole that is large enough to receive it. Both jaws of this animal are provided with tusks, of sufficient length and sharpness to make them dangerous weapons.

The courage and pugnacity of the Peccary are well known, and when threatened with attack by a drove, the boldest hunter does not hesitate to climb the best tree that happens to be available. An enraged Peccary, athirst for blood, is to any one not armed with a rifle or a first-rate spear a formidable antagonist. But for their tusks and dauntless courage when attacked, these animals could not have long survived in forests infested by savage jaguars, pumas, wolves and ocelots. Truly, it seems as if this species represents the survival of one of the fittest.

In our southwestern states the regular food of the Peccary consists of acorns, pecans, farmers' crops, seeds and edible roots of many kinds, and (it is said) also frogs, lizards, snakes, and all other ground animals it can catch. If the musk gland situated on the top of the hindquarters is cut out as soon as a Peccary is killed, the flesh will be saved from the musky flavor and odor which without this precaution would soon render it unpalatable.

The Collared Peccary derives its name from a ribbon-like band of white which encircles the animal about where the neck joins the shoulders. Other than this, the hair is of a black color, sprinkled with gray.

The White-Lipped Peccary[2] is a larger species than the preceding, with white hair on its upper lips. It is found only as far north as southern Mexico, but ranges southward to Paraguay.

THE TAPIR FAMILY.

Tapiridae.

In all the world there are at least five species of tapirs, only one of which is found in the Old World. In southern Mexico and Central America, we know of the existence of a species called Baird's Tapir (*Tapirella bairdi*), and in Central America one known as Dow's Tapir (*Tapirella dowi*), but of their life histories very little is known, and at present it is impossible to describe them adequately.

The South American Tapir[3] is so frequently seen in captivity, and is already so well known, that it may well be chosen as the representative of the only Family of odd-toed Ungulates existing on this continent. It takes kindly to captivity, grows rapidly, and always manages to look well-fed, and as sleek as a seal. Its color is a rich mahogany brown, its head is long and triangular, and its long, prehensile nose, ever soliciting something to eat, is strongly suggestive

[1] *Tay'as-su ta'ja-cu.*

[2] *Tay'as-su al-bi-ros'-tre.* [3] *Ta-pi-rel'la ter-res'tris.*

of the end of an elephant's trunk. The shoulder height of a full-grown animal is about 37 inches.

The species best known to the world inhabits Venezuela, the Guianas, Brazil, Paraguay, Uruguay and the northern portion of the Argentine Republic. Although tapirs are usually found along small and well-shaded rivers in the hot lowlands of the tropics, they are also frequently found on forest-covered mountains. They are exceedingly shy and wary, and under all circumstances are difficult to find. Without dogs it is almost impossible to outwit them. When attacked they always head for the nearest stream, and plunge into the water for concealment. Their food consists of soft and fleshy plants that grow in or within easy reach of streams, and in dense forests where the humidity is great. The flesh of all tapirs is said to be very palatable, and in South America it is much sought by hunters.

The South American Tapir thrives in captivity, either with a bath-tank or without, and breeds. Many have been born and reared in captivity.

Baird's Tapir.[1]—For fifty years or more a score of zoologists have known that the jungles of Central America, from southern Mexico to the Isthmus of Panama, have been sheltering two big species of tapir, Baird's and Dow's. To all other persons in the United States, until very recently, those animals have existed as the least-known big-game animals of all America. Four American museums have mounted specimens, but for years our efforts to procure living specimens were futile. At last, however, fate was more kind.

Baird's tapir is very different from the common South American species. When young it is very stockily built, and its hair is so dark in its brownness that it seems almost black. Each ear is margined with white. The adult animal is of a lighter brown color, and it is said to attain a maximum weight of 700 pounds; which makes it comparable with the Malay black-and-white tapir.

[1] *Ta-pi-rel'la baird'i.*

BAIRD'S TAPIR.
In the New York Zoological Park. This is America's least-known large-game animal.

CHAPTER IX

THE ORDER OF WHALES AND PORPOISES

CETE

To some persons who are beyond the reach of large museums, or a complete work on natural history, the whales, dolphins and porpoises seem very far away. To those who live far from the sea, it might seem justifiable to omit them from our list; but, inasmuch as all Americans travel, and nearly every reader of this book is certain to observe some of the great sea-mammals disporting in the waves of their ocean home, it is necessary to give them a brief notice.

The salt waters of the world are inhabited by what is really a great array of species of fish-like mammals, some of which are the largest creatures that ever inhabited the earth. It is a satisfaction to know that even the largest of the great extinct lizards of North America did not equal the gigantic bulk of a ninety-foot sulphur-bottom whale of our Pacific coast.

Although the Cetaceans are very fish-like in form, and also in mode of life, they are warm-blooded mammals, which breathe air instead of water, drown if submerged too long, bring forth their young alive, and nourish them with milk from their own bodies. For the protection of their flesh and vital organs from the cold of Arctic waters, they are completely enveloped in a thick layer of fat, called "blubber," which lies under the skin, and is impervious to cold. It is as if a man had a layer of felt an inch thick under his skin.

All Cetaceans are destitute of hair, and in most cases the skin is as smooth as plate-glass. The great majority of them have teeth, but many are toothless. Except the whales of greatest commercial value, little is known of the habits of Cetaceans generally. It is very difficult to study creatures that make their home in the sea, and can be closely studied only when killed. Nevertheless, quite a number of interesting facts regarding these strange animals have been brought together, chiefly by observing whalers. Their four Families are as follows :

	FAMILIES.	
CETACEANS: *Cete.*	**1. Baleen Whales:** (without teeth) *Balaenidae.*	"Whalebone" Whales, of large size, without teeth. The mouth is provided with "baleen," commercially called "whalebone." This group includes the *Sulphur-Bottom*, largest of all whales, and about fifteen other species.
	2. Sperm Whales: (with teeth) *Physeteridae.*	Whales with a narrow, beak-like lower jaw, and *formidable* teeth. There are four species, varying in size from the *Pigmy Sperm Whale*, 12 feet long, to the great *Sperm Whale*, 80 feet long.
	3. Dolphins and Porpoises: *Delphinidae.*	This Family includes about thirty species of *Dolphins, Porpoises, Grampuses, Blackfish* and *Narwhals.* They vary in size from the five-foot common Porpoise to the thirty-foot Orca, or "Whale-Killer." All save a very few are harmless, but the Killer is the most savage and dangerous creature that swims the seas.
	4. Fresh-Water Dolphins: *Platanistidae.*	The narrow-beaked dolphins of the Amazon and Ganges.

THE FAMILY OF BALEEN WHALES.

Balenidae.

In one respect, a large whale is like an iceberg. When seen in the water, only a small fraction of its bulk appears, and the remainder must be imagined. On the ocean, one sees nothing of a whale save a rather flat back, and a jet of dense vapor rising and curving back into the sea. Startling indeed would be the sight of a whale's bulk, if it could be seen in its entirety.

The largest and also the swiftest of all whales is the great **Sulphur-Bottom Whale,**[1] of the Pacific Ocean, found from northern California to Central America. So far as we know, this is the largest animal that ever lived upon this planet. Captain C. M. Scammon, one of the most observant and scholarly of all whalers, records the measurements of a specimen taken by him as follows: Total length, 95 feet; length of jawbone, 21 feet; girth, 39 feet; length of longest "whalebone," 4 feet; weight of "whalebone," 800 pounds; calculated weight of whole whale, 294,000 pounds; barrels of oil yielded, 110—not a large quantity.

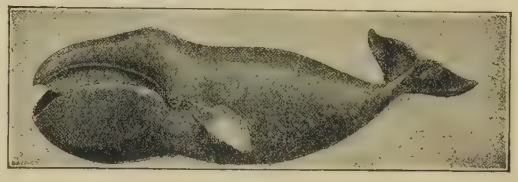
The whales of this Family live upon minute shrimp-like crustaceans, and swimming mollusks (shell-fish) belonging to the group known as pteropods (ter'o-pods) which float in myriads on or near the surface of the sea. To enable the sea-monster to feed upon these very small organisms, and secure them in a wholesale way, the roof of the mouth is provided with two great masses of thin, horny plates set edgewise on each side, and very close together. The lower edges of these plates (of "whalebone") are frayed out into a mass of what looks like coarse, bristly hair, and these frayed edges unite into a web of filaments as long and as wide as the whole inside of the mouth.

In feeding, the whale swims through a mass of floating pteropods, with its mouth open; and the fringe of the baleen, hanging down upon the sides of the lower jaw, forms a perfect strainer for catching even the smallest creatures afloat.

Captain David Gray has stated that sometimes the whale finds its food under water, at a depth of from sixty to ninety feet. In gathering it the animal dives, holds its breath like any air-breathing animal, and after an interval reappears at the surface to breathe, swallow the food collected, and rest before diving again.

The young of a whale is called a "calf," and usually the mother is very solicitous for the welfare of her offspring. She suckles it until it is able to seek other food than her milk.

The Bow-Head Whale, also called **Greenland,** and **Polar Whale,**[2] of the polar seas around the north pole, is known by the immense size of its head and the semicircular arch of its jaws. Its individual plates of baleen are sometimes 10 to 12 feet in length. This material is now scraped very fine, and mixed with the silk fibre of dress silks, to make the cloth rustle when worn, and also give it stiffness. It is now of such high value commercially that the baleen whales are being pursued as far north as vessels can go.



BOW-HEAD WHALE.
Balaena mysticetus.

When a whale is struck by a harpoon, it dives deeply to escape its foes, and remains under water as long as possible. The comfortable period for a whale to remain under water is fifteen minutes, but in feeding below the surface, this is often extended to twenty-five minutes. Harpooned whales sometimes descend 300 feet and lie on the muddy bottom of a shallow sea for a period of from fifty minutes to an hour and twenty minutes.

But whalers know that their victim must sooner or later come to the surface, or drown. As a whale reaches the surface, it immediately discharges its breath from the blow-holes situated on top of its head. A whale does not spout water, but the breath which comes from its lungs is so heavily laden with moisture that at a little distance it looks like water, especially when it curves over and falls into the sea.

In addition to the above, the most important species of baleen whales are these:

[1] *Bal-ae-nop'ter-a sul-fu're-us.*

[2] *Bal-ae'na mys-ti-ce'tus.*

The Right Whale (*Balaena glacialis*), of the cool waters around the north pole and the Atlantic Ocean, north and south, attains 70 feet, but usually runs under 50 feet.

The Pacific Right Whale (*Balaena sieboldii*) inhabits the North Pacific.

The Humpback Whale (*Megaptera nodosa*), of the Atlantic, off the United States coast, is the species most frequently seen from the decks of passenger steamers and stranded on our coast. Its usual length is from 45 to 60 feet.

The Finback Whale (*Balaenoptera physalus*), of the North Atlantic coast, attains 60 feet, but yields little oil, and is difficult to kill.

The California Gray Whale (*Rachianectes glaucus*), from the arctic seas to Lower California, attains 45 feet. It is fond of shallow water, and is savage and dangerous.

The Whaling Industry in 1927.—The whales off-shore of Alaska are now being thoroughly cleaned up by an American North Pacific Company and its six steam whalers, with the following catch in 1925: 233 finback whales, 193 humpbacks, 36 sulphur-bottoms, 33 sperm and 1 right whale. The values of the various products and by-products were as follows: whale-oil, $509,310; sperm-oil, $46,637; meat fertilizer, $53,372; bone fertilizer, $3,927; pickled meat, $6,113; and 19 whale carcasses valued at $5,600. Total, $624,959, an increase of 59.5 per cent over the total products of 1924.

The last word in modern whaling is contained in the report of the New York *Herald Tribune*, of May 29, 1927, on the return of the giant whaling depot ship, *C. A. Larsen*, from three months of intensive whaling in the Bay of Whales, Ross Sea; which sea is beside the Antarctic continent, and only 700 miles from the south pole. The *Larsen* brought to New York on May 27, 1927, 48,000 barrels of oil, or 1,512,000 gallons, to be used in soap-making. This was the yield of *530* whales! And "the 17,500-ton whaler looks more like a towering liner than a whaling vessel." Naturally.

The *C. A. Larsen* has six 200-ton killer boats, each of which carries in its bow a harpoon cannon. Each harpoon weighs 100 pounds, and has on its tip a soft-nosed time bomb, which explodes after the harpoon has penetrated the whale. From those gigantic and powerful whaleboats, there is no escape for a harpooned whale. The *Larsen* is equipped with a new device, consisting of a "drag-tunnel" running up through her bow, 20 feet long and 16 feet in diameter, through which entire whales up to 150 tons dead weight are actually hauled up on deck, and stripped to the last ounce of salable product.

The *Larsen* and her sister ship, the *James Clark Ross*, hail from Norway, which now produces the most persistent hunters of whales, walruses and sea elephants. The $1,000,000 estimate of the value of the *Larsen's* 1927 oil cargo no doubt will so stimulate competition in whale killing that it will sweep the seven seas so clear of whale life that ere long whaling will everywhere cease to be a profitable industry. Apparently we are near the end of the age of Whales.

THE SPERM WHALE FAMILY.

Physeteridae.

It is impossible to give in a few words a clear and adequate conception of the various localities inhabited by the great **Sperm Whale.**[1] It may be said, however, that it is a habitant of the warm seas of the globe, from the North Atlantic, around Cape Horn, to the North Pacific.

The Sperm Whale has an enormous, square-ended head, which constitutes one-third of its entire bulk. Under this great mass is the lower jaw of solid bone, shaped like a letter Y, the stem being fully armed with a double row of huge, conical teeth. In comparison with the great bulk of the head, the lower jaw seems absurdly small; but it is a formidable weapon, and whalers dread it.

In seizing a whale-boat, a man struggling in the water, or any other dangerous enemy, a Sperm Whale turns on its side or back, like a shark, in order to bring its lower jaw over its victim.

The largest Sperm Whales have measured from 80 to 84 feet. At birth they are from 11 to 14 feet long. Their food consists of fish of various kinds, and also squid. A young whale, only twenty feet long, which was taken on the coast of Cornwall, had in its stomach about 300 mackerel. The head of the Sperm Whale yields sperm oil, spermaceti, and teeth which are valuable for ivory. A substance called ambergris, of much value to druggists and perfumers, is obtained from the intestinal canal.

The Sperm Whale Porpoise, or **"Pygmy Sperm Whale"** (*Ko'gi-a*), is found on both the

[1] *Phys'e-ter mac-ro-ceph'a-lus.*

Atlantic and Pacific coasts of the United States. It is a true pygmy, adult specimens being but 15 feet long. They are so rare that their existence in the western Atlantic Ocean was not known until 1883, when a specimen was washed ashore at Spring Lake, New Jersey, and secured by the United States National Museum.

THE DOLPHIN AND PORPOISE FAMILY.

Delphinidae.

This Family contains a number of different groups of animals, some of which are sharply distinct, and are not called by either of those names. The porpoises are distinguished by their blunt noses, and the dolphins by their long, pointed noses and elongated, beak-like jaws. Unfortunately for our purpose, there are a few porpoises with long snouts, and a few dolphins with short, blunt noses; and consequently the two groups run together so confusingly that it is impossible to lay down any rules by which one may always be distinguished from the other. We shall therefore shorten our work by setting forth the species most worth knowing, and leaving the anatomical details of the different genera to be learned in the future.

The White "Whale," or **Beluga,**[1] of the upper half of the northern hemisphere, is not really a whale, but a member of the Dolphin Family. It is creamy white all over, and 16 feet long; has several times been exhibited in aquaria and shows, and is known personally to millions of Americans. One of the fine specimens exhibited in the New York Aquarium in 1897 met its death from suffocation caused by a live eel becoming immovably fixed in its blow-hole, and shutting off its breath so suddenly that the mammal died before the fish could be removed. This species ascends the Yukon River, Alaska, for 700 miles, and is also an inhabitant of the St. Lawrence. Dr. Goode states that the food of the White "Whale" consists of such fish as flounders, halibut, cod, salmon, and eels, and also of squids and prawns. In the St. Lawrence River there is a fishery of considerable importance.

The Blackfish[2] is not a fish, but a jet black member of the Dolphin Family, 15 to 18 feet long, and is shaped very much like a small sperm whale. The head has the same square-ended, sawn-off appearance, and a barely perceptible snout. It is one of the most abundant and important of the small cetaceans of the east coast of North America. Thousands of them have been stranded, or deliberately driven into shallow water, on Cape Cod, sometimes over a hundred in one school. The yield of oil from a single Blackfish varies from ten gallons to ten barrels. The jaw yields a fine quality of oil much used for sewing-machines, and known as porpoise-jaw oil. The value of a stranded Blackfish on Cape Cod varies from $5 to $40. (G. Brown Goode.)

Once on a voyage from South America to New York, we sighted a large school of Blackfish, travelling south, and playing by the way. Some chased each other, lazily, and half a dozen of them stood on their tails in the water, perfectly erect, with their heads six or seven feet high in the air, as if to look at the ship. Those so standing looked like big, black posts, all ready for wharf building.

The Grampus, or **Cow-"Fish,"**[3] of our Atlantic coast inhabits the same waters as the preceding species, but is not nearly so numerous, nor so stupid in getting stranded in shallow water.

Its color is slaty gray, variegated with irregular white markings, and its length is from 15 to 20 feet.

The Killer "Whale," or **Orca,**[4] is the demon of the seas. This creature has the appetite of a hog, the cruelty of a wolf, the courage of a bulldog, and the most terrible jaws afloat. Its teeth are surpassed in size only by those of the sperm whale. It attacks whales of the largest size, and devours sea-lions, seals and small porpoises as a hungry longshoreman destroys saddle-rock oysters.

A full-grown Killer is from 16 to 20 feet in length, and can always be recognized by the great height of its back fin. The all-black High-Finned Killer, of the Pacific only, has a back fin six feet high. The colors of *Orcinus orca* are those of the pirate's flag of skull-and-cross-bones,—black and white, disposed as shown in the accompanying illustration. This species is found on both coasts of North America, and in the Arctic Ocean.

[1] *Del-phin-ap'ter-us leu'cas.*
[2] *Glob-i-ceph'a-la me'las.*
[3] *Gram'pus gris'e-us.*
[4] *Or-ci'nus or'ca.*

The following quotation from Captain Scammon is the testimony of an eye-witness of the Orca in action:

"Three or four of these voracious animals do not hesitate to grapple with the largest baleen whale. The attack of these wolves of the ocean upon their gigantic prey may be likened in some respects to a pack of hounds holding a stricken deer at bay. They cluster about the animal's head, some of their number breaching over it, while others seize it by the lips, and draw the bleeding monster under water; and when captured, should the mouth be open, they eat out its tongue.

"We once saw an attack made by three Killers upon a cow whale and her calf, in a lagoon on the coast of California, in the spring of 1858. The whale was of the California gray species, and her young was grown to three times the bulk of the largest Killers engaged in the contest, which lasted an hour or more. They made alternate assaults upon the old whale and her offspring, finally killing the latter, which sank to the bottom where the water was five fathoms deep. During the struggle the mother became nearly exhausted, having received several deep wounds about the mouth and lips. As soon as their prize had settled to the bottom, the three Killers descended, bringing up large pieces of flesh in their mouths, which they devoured after coming to the surface. While gorging themselves in this wise, the old whale made her escape, leaving a track of gory water behind."

The swiftness of the Killer is very great, and to all small Cetaceans this savage monster is a genuine terror. An eminent naturalist named D. F. Eschricht, who devoted much attention to the Cetaceans, states that he knew one of these animals to capture and swallow alive, and in quick succession, four small porpoises, while from the stomach of another Killer, but sixteen feet long, were taken fourteen seals! In Bering Sea the Killer destroys large numbers of fur seals, and when walruses were plentiful, even made war on them, also. On the Atlantic coast, it was, until recently, a common occurrence for

CALIFORNIA GRAY WHALES ATTACKED BY KILLERS.
Drawn by J. Carter Beard, from Captain Scammon's narrative.

a band of Killers to chase large schools of blackfish and porpoises into shallow water. They also persecuted the horse-mackerel, or tunny. The Killer is widely distributed, and his deeds of destruction have made him widely known and feared.

The Dolphin.—Few persons cross the Atlantic, or make a voyage of half a dozen days in any direction, without seeing a school of dolphins. In fact, it might almost be said that every voyage has its dolphins. As a rule, they do not appear until the passengers have recovered from sea-sickness, and are on deck, eagerly scanning the surface of the sea for living things.

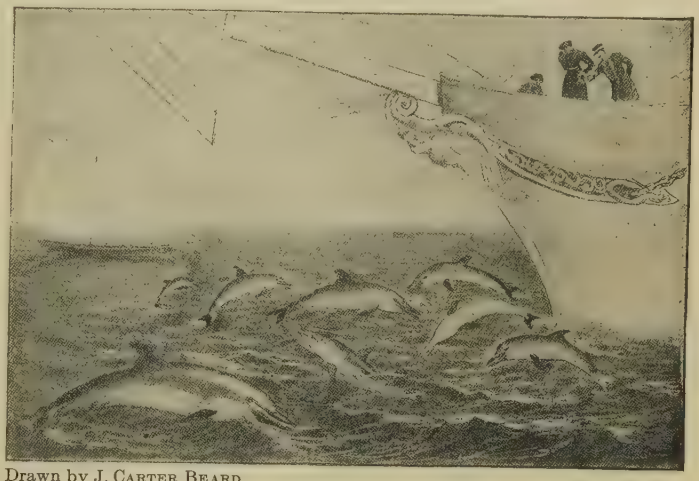
To most voyagers, the sudden appearance of a school of dolphins is a thrilling sight. Hour after hour the eye scans the watery expanse, eager for a sign of life, or gazes with awe and fear into the dark, watery abyss below. Suddenly, out of the steep side of a green-topped wave leap forth a dozen shining, sharp-pointed forms. They seem joyous and full of power, like acrobats entering an arena. In sublime ignorance of man's rapacious nature, they confidently swim within twenty feet of the ship's side. They curve up to the surface, frequently leaping clear of the water, arch their bodies, breathe quickly, and dive again. For a few yards, perhaps, they race along under water, but in plain view, then some leap out again. How easily they keep pace with the ship! Their mastery of old Ocean is so complete that it is a wonderful thing to see.

Sometimes the animals are so near the ship that the species can be determined to a certainty, especially those which are marked by light colors. However, it is no disgrace to any naturalist to declare his inability to say positively what species is alongside.

Dolphins are particularly fond of playing around the bow of a ship; but for some reason best known to themselves, they evince a decided preference for the out-thrusting bow of a sailing ship, and are not attracted so much by the high, perpendicular cutwater of a steamer, with no bowsprit or jib-boom.

A swift ocean steamship is not escorted very far, for such a promenade soon becomes tiresome; but I have seen a school of these interesting creatures circle about a sailing ship, and play around its cutwater for half an hour. It is a simple matter for an expert sailor to take a position on the martingale-guys of a ship, under the bowsprit, and harpoon a dolphin; but to me it has never seemed like a fair thing to do.

In North American waters there are about twelve species of dolphins, most of which are from 6 to 7 feet in length, and but two or three species exceed 10 feet. The Short-Beaked Dolphin of the Pacific is the most beautiful species.



Drawn by J. Carter Beard.

THE COMMON DOLPHIN.

The Common Dolphin,[1] of the Atlantic Ocean, may well be taken as the type of the family of true Dolphins. It is the species that is most frequently seen, and the one longest known. It has a slender, cigar-shaped body, a small head, and its beak is long and narrow. Its length is from 6½ to 7½ feet, and in color it is dark gray above and dull white below. Dolphins generally feed upon small fish, and at times destroy great numbers of mackerel.

The Common Porpoise,[2] of the Atlantic Coast, is a jet black creature, blunt-headed, heavy in action, a veritable pig of the sea. It loves to roll about in the breakers, and loaf lazily in harbors and sheltered bays, and at river mouths. As before stated of porpoises gener-

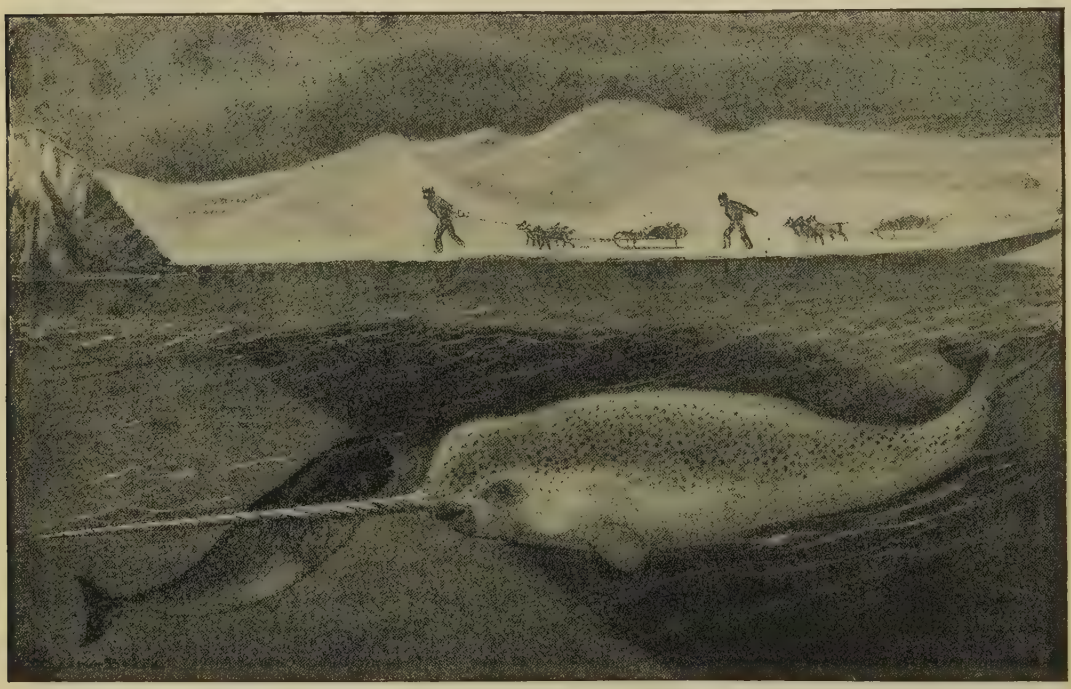
[1] *Del-phi'nus del'phis.* [2] *Pho-cae'na com-mu'nis.*

ally, this animal does not leap from the water, in sheer enjoyment of a "life on the ocean wave," but heaves itself to the surface just high enough to bring its blow-hole out of the water, gives a loud puff or snuff, and then rolls heavily below.

This Porpoise is the species most frequently seen by summer visitors on the Atlantic coast, and in various localities it is variously named. It is known as the **Herring Hog, Snuffling Pig, Puffer** and **Snuffer.** Its length seldom exceeds 4 feet 6 inches. It feeds upon fish, particularly on species like the herring and menhaden, which run in schools, and is said to be very destructive. Its flesh is very dark, its blood is almost black, and on the dissecting table it reeks of oil.

One of the strangest of all Cetaceans is the **Nar'whal,**[1] a creature 16 feet long, mottled black and gray, with a blunt-ended head, no back fin, and with a very long, straight tusk of ivory projecting straight forward from its head. This ivory tusk, which is from 6 to 8 feet long, is twisted throughout its length, from left to right, and is developed only in the male.

The Narwhal's teeth, aside from a few that are merely rudimentary, are reduced to a single pair, lying horizontally in the upper jaw. In the female they remain permanently concealed. In the male the right tooth usually remains similarly concealed, but the left is enormously developed into the tusk just mentioned. Having no other teeth, the creature is obliged to feed upon squids, jelly-fish generally, and small fishes that can be swallowed whole. It is found in the polar waters of the North Atlantic, and the Arctic Ocean north of the Old World, but is now rare in accessible waters. When Nansen and Johansen were retreating southward over the ice, after their dash toward the pole, each man with three dogs dragging a sledge with a kyak upon it, the first living creature actually observed by them was the Narwhal, in the lanes of water then rapidly forming in the great ice-pack, in Latitude 83° 36′.



THE NARWHAL, ADULT AND YOUNG.

[1] *Mon'o-don mon-o'ce-ros.*

CHAPTER X

THE ORDER OF SEA-COWS

SIRENIA

In certain warm and deep rivers of the tropics and sub-tropics, where water plants grow abundantly and all nature seems at peace, there live certain species of water mammals of strange form and habits. The manatees and dugongs differ so widely from even their nearest relatives in other Orders, that it is not an easy matter to introduce them.

The body of a Sirenian is like that of a long-bodied seal. The neck is very large, but extends straight forward, and terminates in a small, blunt-ended head with very small eyes and lips so extensible and mobile in the manipulation of food that the artist who tries to draw their moods and tenses soon finds himself quite bewildered. There are no incisor or canine teeth, and the serrated molars are intended only for the bruising and cutting of tender plants.

There are front flippers of good dimensions, but they are wellnigh useless, and about as shapely and graceful as a pair of old shoes. Apparently they are made for use in gesturing rather than in work, for when the animal rests upon the ground, the flippers break squarely at two joints, and are folded under the body, backs downward! There are times, however, when the flippers are of some use in feeding, in holding food and conveying it to the mouth. Instead of hind legs, there is a broad, flat tail, nearly as wide as the body of the animal at its widest point. The skin is almost as naked as that of an elephant, and about one inch in thickness. When twisted and dried strips of it make practicable canes. The flesh is well-flavored, and wherever taken is eaten with relish.

Usually the Sirenians live in the lower reaches of rivers that flow into the sea, sometimes in water that is bitterly salt, frequently in brackish water, but in most cases quite above tidal influence, where the water is fresh and sweet. Never, so far as we know, do they live in shallow water, and as a rule they prefer a depth of about fifteen feet. So far as we know, only one species of the Order has ever inhabited a land of ice and snow. The divisions of the Order are as follows:

THE ORDER OF SIRENIANS.

	FAMILIES.	SPECIES.	
ORDER SIRENIA:	MANATEES, *Triche'chidae:*	*Trichechus Latirostris*	Florida, Central America, Mexico, Cuba.
		Trichechus Americanus	South America to the Amazon.
		Trichechus Senegalensis	West Africa.
	DUGONGS, *Dugong'idae:*	*Dugong Dugon*	Africa, Ceylon, India.
		Dugong Australis	Australia.
	RHYTINA, *Hy-dro-dam-al'i-dae:*	*Hydrodamalis (or Rhytina) Gigas*	Bering Island (*now extinct*).

The Manatee, or **Sea-Cow,**[1] will not often be seen outside of museums, but it must be introduced here in order that the readers of this book never need ask, as do thousands of other persons —"What *is* a Manatee?"

This creature, the only American representative of its Order except the extinct Steller's sea-cow, is a large and heavy water mammal, from 9 to 13 feet in length, and in form very much like a seal. It has a blunt muzzle, small eyes, and rather feeble, clumsy front flippers. Its tail is a

[1] *Tri-che'chus lat-i-ros'tris.*

rounded disc, which in swimming forms a powerful propeller. When dry its skin is of a clean, slaty-gray color, but in the water it seems almost black. The bones are solid and heavy, and the ribs are very thick. The largest specimen ever taken and preserved in the United States was 13 feet in length, and must have weighed about 1,200 pounds. In the summer of 1903, a fine specimen about eight feet long was captured under a state permit in the Banana River, Florida, and placed on exhibition in the New York Aquarium. From time to time, others have been exhibited at various watering-places along the Atlantic coast.

The Manatee never comes upon land. Usually its home is chosen in the upper waters of some deep, quiet tropical river, above the influence of the tide, where there is an abundance of manatee grass and other water plants acceptable to it for food. It is herbivorous, and because its molar teeth are weak, and there are no front teeth, it is compelled to live upon aquatic plants which are tender as well as nourishing. Its food is always eaten under water, and when at home, its presence is generally revealed by the bits of plant stems and grass blades which escape and float to the surface. In captivity, the Manatee feeds upon lettuce, cabbage, canna leaves, celery tops, water-cress, spinach, eel-grass and ocean sea-weed.

Even to-day the Manatee is found in Florida, in the Banana, Sebastian and St. Lucie Rivers, and its wanton destruction is prohibited by state laws, under penalty of $500 fine. Occasionally, however, a specimen is netted alive, under a state permit, for exhibition purposes. In the Sebastian River two of the great cold waves of the past ten years unfortunately killed several individuals. Farther south it is found about the Isle of Pines, Cuba, and along the east coast of Mexico, and Central America, while another species occurs in South America as far down as southern Brazil. The flesh of this animal is light-colored, and both looks and tastes like lean fresh pork.

As the result of several years of inquiry, I am convinced that, strange as it may appear, in Florida the Manatee really is being perpetuated. The sentiment in favor of its preservation is almost universal, and there is ground for the belief that this is largely due to the wise liberality of the state authorities in granting a reasonable number of permits to capture specimens alive when the animals are ordered at high prices for public exhibition. I believe that there are more Manatee alive in Florida to-day than there were twenty years ago, even though at one time the species seemed doomed to speedy extinction in the state.

The Dugong is the only living Old-World representative of the Order Sirenia, and between it and the manatee the chief difference is found in the whale-like tail of the former. The Australian Dugong, which attains a length of 14 feet, once was so abundant along the coast of Queensland, between Moreton Bay and Cape York, that a regular fishery was established at Moreton Bay.

The Rhytina, or **Arctic Sea-Cow,** is of special interest to Americans because of the important part it played about the middle of the eighteenth century in the discovery of Alaska. In 1741, the Russian navigator, Captain Vitus Bering, was shipwrecked on Bering Island, and compelled to winter there. The majority of the crew of the *St. Peter* died of hardship, and the remainder also would have perished but for the presence of the great Arctic Sea-Cow, then seen for the first time. To George William Steller, the official naturalist of the ill-fated expedition, the world owes all it ever will know of the life history of this animal. Despite the sufferings he endured, he faithfully and laboriously reduced to writing everything that he observed of the ponderous animal whose flesh sustained the lives of the castaways.

The Rhytina was an animal closely resembling the dugong and manatee, but greatly exceeding the maximum size of either. Steller declared that "the full-grown animal weighs about 8,000 pounds," and from the skeletons that were collected on Bering Island in 1883 by Dr. Leonhard Stejneger, and now on exhibition in the United States National Museum, we know that full-grown animals attained a length of between 20 and 30 feet.

This species was exterminated by whalers who sought it for food, aided by the natives who used both its flesh and skin. It was practically exterminated about 1780, but the last animal was not killed until 1854. (Nordenskiold's "Voyage of the Vega.")

THE MANATEE (*Trichechus latirostris*).

Drawn by J. CARTER BEARD from a living specimen in the New York Aquarium.

CHAPTER XI

THE ORDER OF TOOTHLESS MAMMALS

EDENTATA

Near the bottom of the scale of terrestrial warm-blooded quadrupeds, is found the Order Edentata, so called because several of its members are toothless, and others are nearly so. It contains perhaps a greater proportion of odd and remarkable forms than any other Order, and all are found on the American continent. Many of them are so wonderful in form and habit that they well repay the effort necessary to make their acquaintance. The species fall into three Families, as follows:

	FAMILIES.		EXAMPLES.
ORDER EDENTATA.	ARMADILLOS, . . .	*DAS-Y-POD'I-DAE*, ...	Nine-Banded Armadillo. Six-Banded Armadillo. Three-Banded Armadillo. Giant Armadillo.
	ANT-EATERS, . . .	*MYR-ME-CO-PHAG'I-DAE*, .	Great Ant-Eater. Tamandua.
	SLOTHS, ...	*BRAD-Y-POD'I-DAE*, . . .	Three-Toed Sloth. Two-Toed Sloth.

THE ARMADILLO FAMILY.

Dasypodidae.

With a few exceptions, armadillos are found only in South America. The southern half of that continent was once the home of a wonderful array of gigantic animals belonging to this Order. In the La Plata Museum of Natural History is a procession from the Past. It is a long row of earth-colored, dome-like shells of great thickness, some of them as large as small hogsheads, and curiously ornamented by a scalloped lower edge. Some are provided with huge tails that are studded with many big, pointed knobs, called tubercles. These curious objects are the remains of gigantic armadillos, now extinct, called Glyp'to-dons, which once roamed over the pampas of South America.[1] In many American museums, casts of the remains of one of these weird creatures may be seen in what is known as the "Ward Casts of Fossils." The shell of the Glyptodon copied in plaster by Professor Ward is a nearly perfect dome, 5½ feet long, 4 feet wide and 40 inches high.

With but one exception, the armadillo of to-day is a small creature, finding shelter in burrows which it digs for itself in the earth. Its movements are nervous and spasmodic, and for a short distance it scurries over the ground quite rapidly, running on the ends of its claws, and dodging quite skilfully. Its legs are so short, however, it cannot run far, and when about to be overtaken by a dangerous enemy, it halts, and burrows in the ground with wonderful rapidity. It is not equipped for fighting, for it has no front teeth. Its claws are fit only for digging, and since it cannot climb trees, it prefers to live in burrows, on open prairies.

But Nature has not left these creatures without protection from their numerous enemies. The body is incased in a hard shell, composed of small plates of bone very cunningly joined together, which covers every portion save the breast and abdomen.

The head is protected by a plate placed on its upper surface, and the tail is incased in a chain

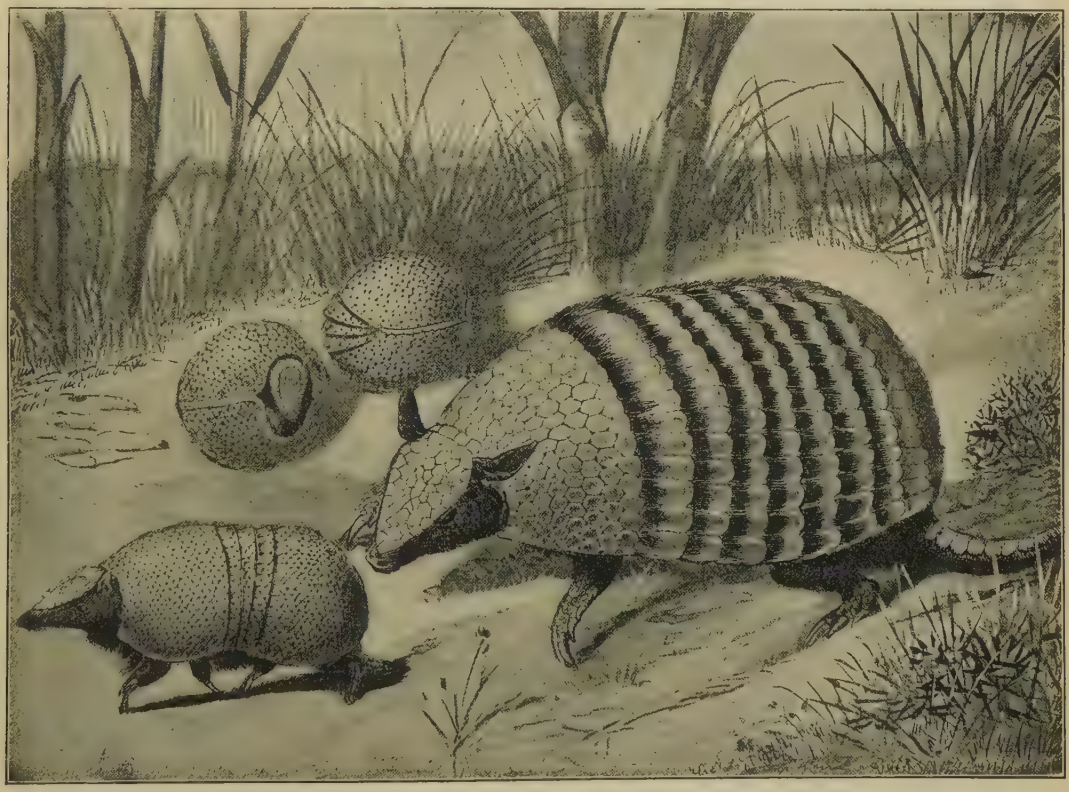
[1] A large Glyptodont, 7 feet long, has recently been discovered in Texas, and described by Professor H. F. Osborn as *Glyptotherium texanum*.

of bony rings. When attacked by a savage animal, the armadillo tucks its legs under the edge of the shell alongside its body, rolls into a ball, and as nearly as possible leaves nothing exposed save its shell. The creature thus becomes a living nut that is not to be cracked and eaten by every enemy that comes along.

If the shell is strong enough, the armadillo is safe; but if it is not strong and hard, nor entirely perfect as an envelope, a jaguar or puma may possibly kill the animal and devour it.

The armadillos with the weakest armor have found it wise to avoid the forest home of the jaguar and puma, and live on the open plains, where they are less liable to be killed. To enable them to do this, Nature has provided them with long and powerful front claws, with which to dig burrows in the hardest soil.

It was in Argentina that the great armadillos of the past reached their highest point in size and abundance. From thence, smaller species ranged northward, until in southern Texas and Arizona we find the northern limit of the group, and the only species found in the United States. There are three species of armadillos that from time to time appear, alive, in zoological parks, the nine-banded, six-banded, and three-banded. The largest species now living is so rare it is very seldom seen in captivity. It is the giant armadillo, of northeastern South America.



THE THREE-BANDED ARMADILLO (1–3), AND SIX-BANDED ARMADILLO,[1] (4).

Figures 1–3 represent half-grown specimens.

The Three-Banded Armadillo,[2] of Argentina, represents the highest degree of perfection attained, either past or present, by any member of the Family.

Its shell is very strong, and so perfect is its mechanism that when the animal is in danger, it makes of itself a round ball, so completely incased in horn that no four-footed enemy can penetrate it. Even the top of the head is protected by a shield which acts as a shutter when the animal rolls up, and wishes to close the only

[1] *Tol-y-peu'tes tri-cinc'tus.* [2] *Das'y-pus sex-cinc'tus.*

opening leading into the shell. It gives one a very queer sensation to handle one of these living nuts, and note the marvellous ingenuity in design and skill in mechanical execution which has been displayed in providing this special means of protection for an otherwise defenceless creature.

Having such excellent defensive armor, the Three-Banded Armadillo does not often burrow in the ground, and it ranges freely by daylight. In running it touches only the ends of its claws to the ground, and the shell is held high. The head-and-body length of the adult animal is about 14 inches, and the tail measures 3½ inches.

The Nine-Banded Armadillo[1] ranges all the way from southern Texas and Arizona to Paraguay, and along the Rio Grande is so common that living specimens are sold at $2 each. In Venezuela I found it burrowing on the open savannas, going down about four feet, in a hole seven inches in diameter. The flesh of this creature is well-flavored, and is generally esteemed as palatable food. Being in a state of perpetual hunger, we found Armadillo stew very much to our taste. The Nine-Banded Armadillo has a total length, from nose to end of tail, of about 26 inches, and in bulk is about the size of our opossum. In captivity its food is milk, boiled eggs, and chopped meat, but in a wild state it feeds upon a mixed diet of worms, ants, snails, beetles, small lizards, grasshoppers, and other insects. The young in a litter vary from six to ten.

THE GREAT ANT-EATER (LOWER FIGURES) AND THE TAMANDUA (UPPER FIGURE).

[1] *Ta'tu no'vem-cinc'tum.*

THE FAMILY OF ANT-EATERS.

Myrmecophagidae.

The ant-eaters form another Family of Edentates, also confined to South and Central America, and all its members are absolutely toothless. The most celebrated member of the group is the **Great Ant-Eater.**[2] Although it is very unlike a bear, it is sometimes called the **Ant-"Bear";** and when once seen it is never forgotten. The most peculiar thing about it is the extraordinary length of its head, which in front of the eyes is prolonged into a slender beak, with the mouth and nostrils situated at its tip end. The opening of the mouth is just large enough to admit the blunt end of a lead-pencil.

[2] *Myr-me-coph'a-ga ju-ba'ta.*

The feature which comes next in oddity is the big, fleshy tail, covered with an enormous brush of coarse, wavy hair. The popular belief in South America that the Ant-Eater sweeps up ants with its tail in order to devour them in a wholesale way, is quite erroneous, for the tail serves a very different purpose. Its use is to cover the owner when asleep. When the animal lies down to sleep, the tail is flung over the body, and the long, wavy hair forms a thatch so thick that no other portion of the creature is visible. It looks like a pile of brown hay. A medium-sized specimen that lived for about a year in the New York Zoological Park measured 12 inches in length of head, the neck and body, 31 inches, and tail vertebrae, 26 inches.

In its wild state, the Ant-Eater feeds upon ants, which it devours in great quantities. In fact, Nature has provided this Family of animals to restrict the number of plague-like ants which, even with Ant-Eaters in the forests, are entirely too numerous. Its long and powerful front claws are very useful in tearing open ant-hills, and dissecting decayed logs, but as a means of defence they are quite inadequate. Neither are they well-formed to walk upon. The tongue is very long and slender, and can be thrust out 9 inches; but, contrary to innumerable misstatements, it is as clean and smooth as the tongue of a dog, and is *not* coated with sticky saliva, or anything like it.

This animal is very clumsy on its feet, and being defenceless, unable to climb, and too large to live in a burrow, it is a wonder that all the Great Ant-Eaters were not killed and devoured long ago, by jaguars and pumas. Although quite rare, even in South America, a goodly number of specimens find their way into captivity. Until settled down sensibly to a diet of chopped meat, milk, and eggs, they are difficult to keep alive. Our specimen persistently refused to eat ants.

The **Tamandua**[1] is a smaller Ant-Eater than the preceding species, of tree-climbing habits, with a proportionately shorter head, no long hair on its tail, and extremely large front claws. It is found in Venezuela, the Guianas, Brazil, and in fact the greater portion of the region of tropical forests on this continent south of Mexico. Its tail is prehensile, or grasping, and in climbing is used almost constantly. One of these creatures which I once kept in South America as a camp pet, became very friendly, and even affectionate, and when permitted would climb all over me, as if I were a new and very soft species of tree. In the accompanying picture, the Tamandua is represented by the small central figure. Its head-and-body length is about 24 inches, tail 18 inches.

[1] *Tam-an'du-a tet-ra-dac'ty-la.*

THE SLOTH FAMILY.

Bradypodidae.

The sloths inhabit the New World only; and the so-called "sloth" of Ceylon is not a sloth, but a slow lemur. All the real sloths belong to the Order of Edentates, and inhabit the tropical forests of Central and South America, from Costa Rica southward. The sloths are not really toothless, for they have five pairs of teeth in the upper jaw, and four in the lower.

One cannot look at a live sloth without thinking that Nature has but poorly equipped this animal to live in this murderous world. Its countenance is a picture of complete and far-reaching stupidity, its bodily form the acme of four-footed helplessness. It can neither fight, hide, nor run away. It has no defensive armor, nor even spines. It is too large to live in a hole in a tree, and too weak to dig a burrow in the earth. It is too tired to walk on its feet, as the monkeys do, so throughout its queer life it hangs underneath the branches of the trees in which it finds its food. Its feet are merely four hooks by which to hang. Since it feeds wholly upon leaves and buds, it lives in the tropical forests, where green leaves are plentiful and cheap.

The sloth dwells only in the tree-tops, among the monkeys and macaws. On the ground, it would be more helpless than a tortoise, and easily killed by any carnivore, or wild pig. In the tree-tops, it escapes the climbing ocelot by living far out on the ends of the branches; and it is fortunate for him that hawks, owls, and eagles are scarce in the forests wherein he dwells.

At this point, however, it is a pleasure to point out that Nature has done one special thing for the preservation of these odd creatures. The hair of a sloth is long, wavy and coarse, rather more like grass than hair, and in color and general appearance it is the best imitation of tree-

bark that has been given to any quadruped. This resemblance to bark is heightened by the fact that the back hair of many a sloth in its native forest has a greenish tint, like moss on a tree-trunk, due to the presence on the hair of living vegetable algae. This aids the sloth in escaping observation.

On the mighty Essequibo River, in British Guiana, I once made a special hunt for sloths. Having found it useless to hunt them by stalking through the dense and lofty forests, I took a leaky old canoe, an Indian to help furnish power, and paddled fifteen miles and back. We followed the shores, going and coming, and secured eight specimens of the **Three-Toed Sloth,**[1] the one with a brown saddle-mark of short hair in the middle of its back.

We found them in the tops of low trees at the water's edge, spread-eagled on the outer branches, or hanging upside down, but always eating leaves. They did not know what it was to "take alarm," and try to escape. Judging by the awful deliberation of those that we saw in motion, I estimated that a really swift sloth could travel half a mile in twenty-four hours, if not sidetracked.

We shot some of our specimens, and others we took alive by cutting down their trees. One tree fell with its top in the river, and the sloth was carried four feet under water. But even the prospect of drowning did not make him hurry to the surface. To my amazement, he climbed up through the branches, slowly and deliberately, until at last, with dignity entirely unruffled, he appeared above the surface, and looked at me with a most disgusted expression on his wooden countenance.

Sloths eat so slowly that before one meal is over it is time for the next, so that their meals overlap one another.

The Three-Toed Sloth is not found above the Isthmus of Panama, but two other species inhabit Central America as far north as Nicaragua. It is considerably smaller than the next species, having a head-and-body length of 21 inches, while the spread of its outstretched arms, exclusive of the claws, is 32½ inches. The tail is so very short that it seems to be wanting entirely, but in reality its length is 1½ inches.

[1] *Brad'y-pus tri-dac'ty-lus.*

The Two-Toed Sloth,[2] also called **Hoffman's Sloth,** ranges northward as far as Costa Rica. It is the largest living member of the Sloth Family, and its appearance is well shown in the accompanying picture of a specimen kept in the Zoological Park. It inhabits the same regions as the preceding species, but is less common. It is occasionally seen alive in large zoological gardens, and when once properly acclimated, lives in captivity very well. Usually, however, it is difficult to keep alive. In captivity its food is chopped carrots, cabbage, lettuce, and boiled rice. A sloth usually sleeps suspended from a branch, but at the same time it always seeks a position in which it can rest its body on a branch below parallel with the one to which it clings.

SANBORN, Photo., N. Y. Zoological Park.

TWO-TOED SLOTH.

In prehistoric times, a Family of gigantic ground sloths, called **Meg-a-the'ri-ums,** creatures as large as the largest rhinoceros, lived on the pampas of southern South America and also in the southern United States. Plaster casts of the entire skeleton of the most celebrated species (*Megatherium cuvieri*), from South America, 17 feet 9 inches long, are now to be found in many American museums.

[2] *Cho-loe'pus hoff'man-i.*

CHAPTER XII

THE ORDER OF DIGGERS

EFFODIENTIA

This Order contains only a very small number of genera and species, all of which are confined to the Old World. They are the pangolins of Africa and the Far East, and the aard-varks of Africa. Until very recently, these animals have been classed with the ant-eaters, sloths and armadillos, in the Order Edentata, or toothless mammals. But both in internal and external anatomy they differ widely from their very distant American relatives.

The latest and most exact classification assigns them to a new and wholly independent Order, called Ef-fo-di-en'-tia, which means "Diggers." Its divisions are as below:

	FAMILIES.		EXAMPLES.
ORDER EFFODIENTIA.	PANGOLINS, . . .	*MAN'I-DAE*, ...	Manis, or Pangolin, of India. *Manis pentadactyla.*
	AARD-VARKS, . . .	*O-RYC-TE-RO-POD'I-DAE*,	Aard-Vark, of South Africa. *Orycteropus a'fer.*

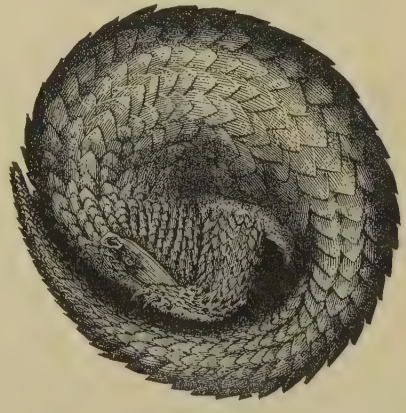
THE PANGOLIN FAMILY.

Manidae.

One good look at a pangolin, or manis, is enough to arouse curiosity, and provoke inquiry. Like the armadillo, it is one of the wonders of the living world,—absolutely toothless, dwelling upon the earth, surrounded by savage and merciless enemies, but safe in the protection of a complete suit of plate armor, and powerful claws for digging. There are about seven species in this Family, scattered all the way from China and Borneo to South Africa, excepting the break in the chain caused by the deserts of North Africa and Arabia. Of the three African species, two are distinguished by the extreme length of their tails, and one by its great size, six feet in length, which entitles it to the name **Giant Pangolin.**

The **Indian Pangolin,** or **Manis,**[1] of Ceylon and India, generally in the lowland forests, may be chosen as the representative of this Family. My first feeling toward it is that of friendship and gratitude, for in the jungles of Ceylon a living specimen once furnished me entertainment, anxiety and sustenance.

My first Manis was brought by a native, who carried it in a bag over thirty-five hot and dusty miles. While in transit on man-back, the animal kept himself comfortably coiled, but when set free upon the ground he promptly uncoiled



AN INDIAN PANGOLIN, ROLLED UP.

and stood up for inspection. He was 36 inches long, including the tail, which measured 17 inches, and his weight was 18 pounds.

From the tip of his nose to the end of his tail, he was covered with broad, flattened shield-shaped plates, or scales, of clear, gray horn.[2]

[1] *Man'is pent-a-dac'ty-la.*

[2] Museum specimens are usually of a yellowish-brown color.

Those plates, which were concave underneath and convex above, lay close down upon the skin and upon each other, and were arranged in rows or courses, perfectly imbricated (*i.e.*, joint-breaking) like the scales of a big fish, or a hawk's-bill turtle. We presently discovered that they were fully controlled by the voluntary muscles of the skin. The tail was very broad, measuring 5½ inches across where it joined the body, slightly hollowed underneath, and rounded on the top. It was a most useful appendage, and its special function was to protect the head.

In walking, the Manis carried his back very highly arched in the middle. The long and powerful front claws were bent under the feet, until they pointed directly backward, and were literally walked upon. The heavy tail barely cleared the ground, and the nose was always carried low, as if slyly searching for something. Often the creature stood erect on its hind legs, like a kangaroo, especially when looking about for insect food, and as it walked its armor clanked like that of an ancient mail-clad knight.

Whenever he found a colony of ants, he would begin to dig most industriously. After digging a short distance into an ant-hill, and exposing the interior, he would thrust his long and slender tongue into the passage-ways, and draw it out thickly covered with ants.

To me, the most wonderful thing about the animal was its means of protection from its enemies, for it cannot truthfully be called defence. Without some very special provision of Nature, a slow-moving, toothless and hornless terrestrial animal would fare badly in jungles inhabited by leopards, tigers, wolves, jackals and wild swine.

When I first endeavored to become acquainted with my Manis, he immediately tucked his head down between his four legs, brought his tail under his body and up over his head, held it there closely, and thus formed of himself a flattened ball completely covered with scale armor. When I undertook to uncoil him, I could not manage it alone, and called a servant to help me; but the tail clung to the body as tightly as if it had been riveted there. Then I called another man, and while I held the body, the other two pulled on the tail with all their strength, to uncoil it. But in vain. We wrestled with that small animal until we were fairly exhausted, and so great was the power of the tail that we gave up beaten.

From the very first, I had no end of trouble with my scaly pet. I could not tie him, for on no part of his body or limbs would a rope hold ten minutes without hurting him. During the day, he was reasonably quiet, but at night he was very restless, and anxious to go out ant-hunting. For the first night, I shut him up in the main room of the Rest House; and in the morning I found him fully ready to break through a hole he had dug with his big front claws in the ten-inch wall of solid masonry. Well may naturalists assign the Pangolins to the independent Order of Diggers!

The next night, I placed the Pangolin in a large tin box, well covered with boards. At three o'clock in the morning the village dogs raised such a row at the edge of the jungle that my servant went to them to investigate; and it was that animal. It had torn a hole in one corner of its tin prison, and escaped; and but for the very dogs that had so often annoyed me by trying to steal my specimens, it would have been lost to me forever.

THE AARD-VARK FAMILY.

This Family contains but one genus and two species, the **Cape Aard-Vark,**[1] of South Africa, and the **Ethiopian Aard-Vark,** of East Central Africa.

With their usual facility in misnaming wild animals, the Boer pioneers in Cape Colony bestowed upon the species found there the name Earth-"Pig," and it has become a fixture.

The Cape Aard-Vark is as much like a pig as it is like a jack-"rabbit," but no more. Cut off its extremely long and rabbit-like ears, cover it with imbricated scales to fit its body, and externally we will have a rather tall pangolin, about 5 feet long. Unlike the pangolins, the jaws are provided with teeth. The tail is long, thick and heavy, and its special use is not quite apparent.

In the usually wise economy of Nature, these insect-eating animals were developed in Africa for the special purpose of checking the ants of that region. Their powerful front claws enable them to dig with great success into the tall and also numerous ant-hills of Africa, and before the days of universal game destruction, the Aard-Vark was oftenest found where ant-hills were most numerous.

[1] *O-ryc-ter'o-pus a'fer.*

CHAPTER XIII

THE ORDER OF POUCHED MAMMALS

MARSUPIALIA

An animal is said to be "low" in zoological rank according to the distance of its position below the highest types of animal life. Thus, a hairless, fish-like mammal, with very simple teeth, like a porpoise, is far lower than the monkeys and carnivores.

As we approach the Orders of mammals which we have been taught to place at the end of the list, we encounter some very strange forms, which are of greater interest to the special student than some higher forms which are duplicated many times over. Fortunately for our purpose, all the Orders of living mammals, save two, are represented in North America.

Although the Order Marsupialia is too extensive, and the majority of its members too far away, to justify its full exposition here, it is desirable to mention all its Families:

	FAMILIES.		HABITAT.
ORDER MARSUPIALIA.	KANGAROOS,	*MA-CRO-POD'I-DAE,*	Australia, New Guinea, Aru Is.
	PHALANGERS,	*PHAL-AN-GER'I-DAE,*	Australia.
	WOMBATS,	*PHAS-CO-LO-MY' DAE,*	S. Australia.
	CAENOLESTES,	*E-PAN-OR'THI-DAE,*	South America.
	BANDICOOTS,	*PER-A-MEL'I-DAE,*	Australia and New Guinea.
	DASYURES AND TASMANIAN WOLVES,	*DAS-Y-U'RI-DAE,*	Australia.
	OPOSSUMS,	*DI-DEL-PHY'I-DAE,*	North, Central and South America.
	MARSUPIAL MOLES,	*NO-TO-RYC'TI-DAE,*	Australia.

Of these eight Families, only two, the first and seventh, will be specially noticed.

Marsupials are distinguished from all other mammals by the fact that the female possesses in the skin of her abdomen a large, flexible pocket, or pouch, in which the nursing glands are situated, and in which the young are carried for a time after birth, until more fully developed. They differ from ordinary mammals in being without what is called a *pla-cen'ta*, which is an arrangement of veins by which the blood of the mother circulates through the veins of the unborn young. In other words, in a marsupial, the blood of the mother does *not* circulate through the veins of the unborn young. As a result, at the time of its birth, the young marsupial is a tiny creature, hairless, blind, and utterly helpless. Even the young of a large kangaroo looks more like a little lump of jelly than a highly organized living creature. One which I saw in the London Zoological Gardens was less than an inch in length, and no thicker than a lead-pencil.

The newly born young is taken by the mother, in her front paws, and placed in her pouch; and the half-formed creature, with a mouth specially formed for suction, attaches itself to the nursing gland, and so remains for many days, or even weeks. Slowly it grows, until it develops hair, and its eyes open. At length it becomes large enough so that it ventures to stick its little head out, and view the world. By and by it climbs

out, to take exercise, but jumps back again at the first alarm. In an animal which travels as far each day as the kangaroo, a pouch for the conveyance of the young is a great convenience.

THE KANGAROO FAMILY.

Macropodidae.

In Australia, the land of queer things, nearly all the land mammals are marsupials. The Order includes the kangaroos, large and small, wombat, Tasmanian wolf, Tasmanian devil, koala, and many others. All kangaroos come either from Australia, Tasmania, or New Guinea, but one group of small wallabies extends its range to New Britain and the Aru Islands. The great majority of these creatures dwell on the ground in the open plains, or in the "bush" of Australia. In northern Queensland and New Guinea are four species of Tree Kangaroos, which actually climb trees, and inhabit them.

BRUSH-TAILED ROCK WALLABY (*Petrogale penicillata*).
Length, head and body, 28 inches ; tail, 24.

The largest species is the great **Gray Kangaroo,**[1] also called "*Old man*" and "*Boomer,*" which stands over 4 feet high, weighs nearly 200 pounds, and when frightened can leap twenty feet or more. The smallest species are the **Rat Kangaroos,** some of which are but 14 inches high. Despite their nocturnal habits specimens are frequently seen in captivity. One of the handsomest of all the species is the **Red Kangaroo,**[2] a creature about 4 feet high, frequently seen in captivity, and quickly recognized by its brick-red color, and fine, silky hair. Several small species of Kangaroos are called **Wallabies,** and the species figured herewith is a good representative of this whole Family.

The Kangaroo is a strange variation in form from the ordinary terrestrial mammal. Its extremely long, strong hind legs, and massive tail, also of great length, form a wonderful jumping machine. The tail not only assists the animal in leaping, but it also serves as a balancing pole, and keeps its owner from losing his proper position when in mid-air. It is reasonably certain that a Kangaroo without a tail would frequently overbalance when leaping, and turn somersaults. Kangaroos were once very abundant in Australia, but the general settlement of that country, and the systematic killing of the animals for their skins, which are used as leather for shoes, has so greatly reduced the number that now one must go far inland in order to find them wild.

Most pouched mammals are strictly herbivorous, but some, like the opossum and Tasmanian wolf, are true flesh-eaters.

[1] *Mac-ro'pus gi-gan'te-us.*
[2] *Macropus ru'fus.*

THE OPOSSUM FAMILY.

Didelphyidae.

The New World contains more than twenty species of omnivorous animals, varying in size from a large cat to a small rat, mostly provided with long, hairless tails that are fully prehensile, and always well clad with fine and abundant hair. In all species save a few, the female possesses the abdominal pouch to which every marsupial female is entitled, but in some species it is either rudimentary or wholly lacking. These animals are the **Opossums,** and while the majority of the species are confined to South America, our North American representative is about as widely known as all the tropical species combined.

The Virginia Opossum[1] is a typical marsupial, but differs widely from all the Australian members of that Order. Seemingly it is a dull-witted, slow-moving creature, and so ill-fitted by Nature either to fight or to run away, that it might be considered almost defenceless. But let us see what use this odd little animal makes of the physical and mental equipment which Nature has given it.

It eats almost everything that can be chewed, —wild fruit, berries, green corn, insect larvae, eggs, young birds and quadrupeds, soft-shelled nuts, and certain roots. It is a good climber, and has a very useful prehensile tail. It forages on the ground quite as successfully as a raccoon. Usually it burrows under the roots of a large tree, where it is impossible for a hunter to dig it out, but sometimes it makes the mistake of entering a hollow log. Like the bear and woodchuck, it stores up under its skin a plentiful supply of fat for winter use, when food is scarce and dear. Above all, the female has a nice, warm pouch in which to carry and protect her helpless young, instead of leaving them in the nest to catch their death of cold, or be eaten by some enemy.

The young of the Opossum vary in number from seven to eleven. Not until they are about five weeks old do they begin to venture away from the mother; but for a season they are very careful not to get beyond grabbing distance of her shaggy coat.

The Opossum is a very hairy animal. Its under fur is woolly and white, and the outer coat is straight, coarse, and tipped with black. The nose, lips, and half the ear are pinkish white, and the eyes are like a pair of shoe-buttons. The tail is naked, white, and strongly prehensile.

A large specimen has a head-and-body length of 15 inches, tail 12 inches, and the weight of a large specimen is 12 pounds. In the South, the flesh of this animal is much prized as food, and I can testify that when properly roasted, and served with nicely browned sweet potatoes and yellow corn bread, it is an excellent dish.

One habit of this animal is so remarkable and so widely known it has passed into a proverb,—

VIRGINIA OPOSSUMS.

"playing 'Possum." When found by hunters, the Opossum deliberately feigns death, hoping to escape by being "left for dead." Give it a tap on the head or back, and it stretches out, limp, motionless, and seemingly quite dead. Its breath is so short and feeble the thick fur almost conceals the chest movement.

When but a lad I killed my first Opossum in an Indiana forest, and had carried it by the tail for half a mile when we came to a rail fence. In climbing through, I noticed that the front claws of my Opossum caught on a rail, and held fast in a manner highly unbecoming in an animal that was honestly and sincerely dead. A close examination revealed the fact that my victim was only nominally dead. In other words, it was fully alive, and sharply watching for a chance to escape. This discovery led me to keep the animal alive in confinement, until finally it did escape.

The Virginia Opossum is the species found in the United States, from New York to Florida, and westward through the southern States to

[1] *Di-del'phis vir-gin-i-an'a.*

Texas. In Mexico and tropical America several other species are found. Notwithstanding the persistent destruction of the Opossum, both for moonlight sport and for food, it still manages to survive throughout its entire original range, and bids fair to outlive the native American.

means *Mouse-Like Opossum*—is a South American species which is remarkable because of its diminutive size. The full-grown female specimen shown in the accompanying illustration, with a brood of seven hairless young clinging to the fur of her body, is about the size of an eastern chip-

E. R. Sanborn, Photo., New York Zoological Park.

MURINE OPOSSUM AND YOUNG.
About one-half life size.

As a pet, or cage animal, the Opossum shows off very poorly, and is rather uninteresting. In the daytime, its sole desire is to curl up into a furry ball, and sleep. If disturbed, it opens its pink mouth very widely, in silent protest, and as soon as the trouble is over, again tucks its head under its body, out of sight, and sleeps on.

The Murine Opossum[1]—a name which

[1] *Mar-mo'sa murina.*

munk. The abdominal pouch is wholly wanting in this species, and from birth the naked and almost helpless young must either cling to the fur of the mother or die. As they grow larger, they travel on the back of the mother, with their tendril-like tails clinging to her tail.

The specimen shown reached New York just as a score of others have before it,—hidden in the interior of a bunch of bananas!

CHAPTER XIV

THE ORDER OF EGG-LAYING MAMMALS

MONOTREMATA

"There are more things in heaven and earth, Horatio,
Than are dreamt of in your philosophy."

There are two Families of mammals the members of which lay eggs, from which their young are hatched as are those of birds. They form the lowest order of mammals, and in one respect this group forms a good connecting link between mammals and birds:

	FAMILIES.		
ORDER MONOTREMATA: *Egg-Layers.*	DUCK-BILL, . .	*OR-NI-THO-RHYN'CHI-DAE,* .	The Ornithorhynchus or Duck-Bill.
	ECHIDNAS, . .	*TACH-Y-GLOS'SI-DAE,*	Five-Toed Echidna. Three-Toed Echidna.

The Platypus, or **Duck-Bill,**[1] is found only in Australia,—a land of queer things. Not only is it bird-like in laying eggs, but it also possesses webbed feet, and a flat, duck-like bill, from which it derives one of its popular names. The beak is of black horn, and the food is crushed between the cross-ridged plates of the lower jaw and the roof of the mouth.

THE PLATYPUS, OR DUCK-BILL.

This animal is about as large as a prairie-"dog," and its body is similarly shaped; but there the resemblance ends abruptly. Its front feet are webbed quite beyond the ends of the toes, and in digging, the outer edge of the web is rolled back underneath the foot, to expose the claws. The hind feet are webbed only to the base of the claws, and each is provided with a strong, sharp spur an inch long, which is said to be connected with a poison gland.

The tail is broad and flattened, well haired on the upper side, and almost naked below. The hair of the Platypus is dark brown in color. The outer coat is stiff and harsh outside, but the inner is fine and soft. The length of head and body is 13 inches, tail, 5 inches.

The habits of the Duck-Bill are very similar to those of our old friend the muskrat. It inhabits quiet but deep pools of fresh water, burrows deeply into the banks, and is seldom seen save at nightfall. In its burrow it builds a nest for its young, and deposits two eggs, which are enclosed in a strong, flexible shell three-fourths of an inch in length by two-thirds of an inch in greatest diameter. When first hatched the young are blind and hairless, and the beak

[1] *Or-ni-tho-rhyn'chus an-a-ti'nus.*

is very short. The Platypus suckles its young by milk that is sucked through pores in the skin.

For nearly a century it was believed impossible to keep the Platypus alive in captivity, or to transport it to far-distant countries. Its food habits never were known and understood until they were very recently revealed to the world through the studies and experiments of Mr. Harry Burrell, of Sydney, Australia. His book[1] is an admirable popular scientific monograph of the most remarkable of all living mammals.

Mr. Burrell has proven that in comfortable captivity the Platypus can live successfully on angle worms, large insect larvae (called "grubs"), and small shrimps. Of acceptable food, such as

AUSTRALIAN ECHIDNA IN THE NEW YORK ZOOLOGICAL PARK.

the above, an adult animal can consume one-third of its own weight in a day! To satisfy the semi-aquatic habits of the Platypus, Mr. Burrell invented an amazing structure of apartments and passages which afford deep water for swimming, a dry sand bank, and a snug burrow in which to nest and sleep. In its own park-like haunts with quiet river frontage, the Platypus burrows into the hinterland from 20 to 50 feet, and as a domicile constructs with leaves a comfortable round nest, in which it sleeps. The home waters and lands of this creature embrace at least a dozen of the small rivers of the interior of Australia, where the habitants are so widely scattered, and so difficult to find, that the Platypus species seems likely to endure for at least several decades.

Until 1922, no Platypus ever had been transported alive to Europe or America. Many persons regarded successful exportation as impossible. In that year named, however, Mr. Ellis S. Joseph, an enterprising collector of wild animals for zoological parks and gardens, with the assistance of Mr. Burrell, decided to make a determined effort to accomplish the "impossible," by taking specimens to America. Mr. Burrell contributed his Platypus car. Six living specimens were obtained from the Namoy River, New South Wales, and embarked on the journey. One reached New York alive on July 14, 1922, and was safely installed in the New York Zoological Park.

It was at once recognized that the Platypus is an animal of nervous temperament, and that it can endure daily only one hour of exhibition, to a silent and slow-moving line of visitors. By careful management that first transplanted specimen lived forty-nine days. It was seen by thousands of visitors, and read of by millions. On one of its normal days it ate one-half pound of angle-worms, 40 big white grubs and 40 small shrimps. Its total length was 18¾ inches, which is a little under maximum size.

The Echidnas.—The other Family of egg-laying mammals belonging to this Order contains the Echidnas (pronounced E-kid'nas) of Australia and New Guinea. These animals are arranged in two genera, the Five-Toed Echidna (*Tachyglossus*), consisting of a single species which occurs in Australia, Tasmania, and New Guinea, and the Three-Toed Echidnas (*Zaglossus*), comprising two species, confined to New Guinea. The Five-Toed Echidna is covered with strong spines set very thickly all over its outer surface, and its nose is a slender and narrow beak.

As mammals, the Echidnas are amazing developments, and they deserve to rank with the most weird curiosities of the world's vertebrates. But for its too-successful rival, the platypus, this Echidna would be ten times more of a celebrity than it is.

[1] *The Platypus.* Angus & Robertson, Sydney, Australia. (1927.) 25 shillings.

BOOK II

BIRDS

THE BALD EAGLE.

CHAPTER XV

AN INTRODUCTION TO THE BIRD WORLD

Progressive Bird Destruction.—At this date (1927) there is no subject relating to the birds of North America that is so important as their disappearance, and the prospect of the early extinction, or near extinction, of about a hundred valuable species. While even yet there is time to save *some* birds, the chances that this really will be done are rapidly diminishing.

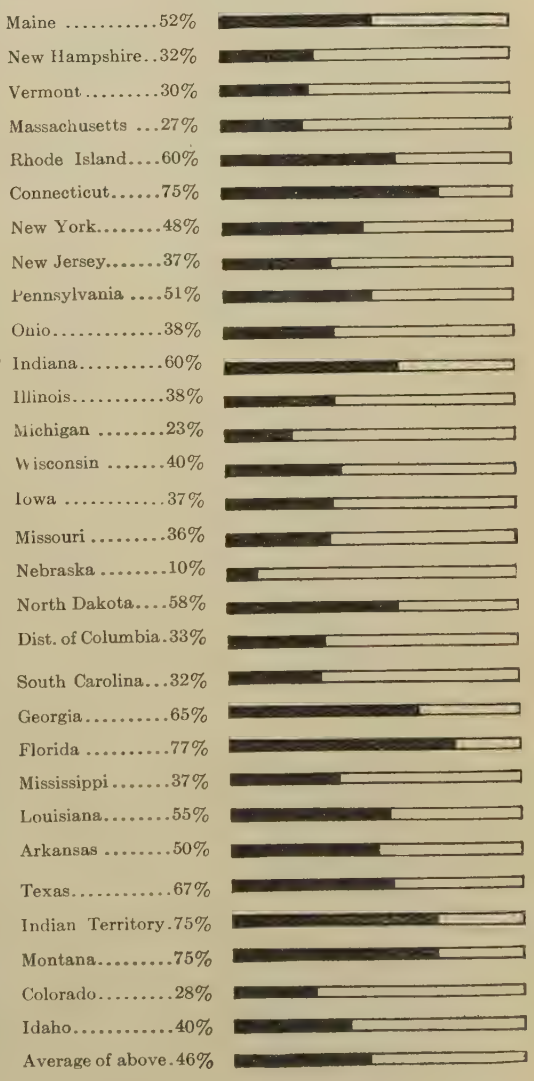
Toward the real protection of birds, at least ninety-five per cent of the American people now are amazingly apathetic. The bird-protection zeal of twenty years ago is dead. The accursed European war made bird protection seem trivial, and of little consequence. Many authoritative persons seem to sincerely believe that we have plenty of good laws for the birds, and many there are who believe that we have "too many laws." Such persons repeat, parrot-like: "Why don't YOU enforce the laws that already are in the books?"—as if that were a legitimate excuse for apathy.

Thousands of persons are declaring,—for reasons known only to themselves,—that "birds are abundant," and "increasing rapidly"; and every such person thereby assumes toward the public a grave responsibility.

The invincible truth is that our "American system" of bird protection is fifty per cent wrong, ineffective, and deadly; that ten million persons are interested in the killing of birds; that the six million bird hunters who annually take the field are progressively and *rapidly* exterminating all our game-birds; that other causes are exterminating our non-game birds; that already many states are destitute of many valuable species, and finally, that only a corporal's guard of disinterested elderly men,—with mighty little expense money,—are fighting against enormous odds to stem the tide of destruction.

Do not believe the people who tell you that our song-birds are "increasing," for *now* that is not true! During the last four years the author of this volume has traveled, in spring and summer, far and wide over the United States,—across, up down, and diagonally,—always in daylight watching for birds, and the awful absence of them ha been appalling. I think there are not one-quarte

DECREASE IN BIRD LIFE IN 30 STATES, IN 15 YEARS.



of the song and insectivorous birds in the United States that were here twenty-five years ago. As for the game-birds, the official records tell a ghastly story of progressive extermination, and "no open season."

In 1897 the author made a careful study, aided by one hundred and eighty competent observers, to determine approximately the shrinkage in bird life that had taken place during the previous fifteen years. The results of that census never have been discredited; they have been confirmed in many ways, and they will continue to stand in this volume as perfectly good and valuable history of what happened to our birds, game and non-game, between 1862 and 1897.

Ever since 1897 the decrease in North American game-bird life has steadily gone on, in all Orders save about half a dozen species of ducks. From 1911 up to about 1919, a few species of ducks showed great gains because of the stoppage of the sale of game and of spring shooting, and the fixing of bag limits. By 1920, however, due to the enormous increase in hunters, automatic and pump guns, and the awful use of automobiles in hunting, the duck supply as a whole began to go down, and proceeded at such fearfully rapid rates that by 1926 no fewer than *twenty-six states out of our forty-eight* had felt compelled to reduce their bag limits on ducks about forty per cent below the figures authorized by the federal government, and to put many species of game on the forbidden list.

To-day the duck hunters of the Atlantic and Gulf coasts point to the big flocks of ducks that in winter are driven together in their waters, as "evidence" that "ducks are increasing," that there is "no danger," and that no "reductions in killing privileges are necessary."

To-day the following species of North American birds, well known to us, are the most unfortunate of the many victims of our lamentably weak system of "protection":

Totally Extinct.

Great Auk	Carolina Parrakeet
Labrador Duck	Eskimo Curlew
Passenger Pigeon	

Nearly Extinct in the United States.

Flamingo	Heath Hen
Scarlet Ibis	Whooping Crane
Roseate Spoonbill	Harlequin Duck
Trumpeter Swan	

Dangerously Reduced

Sharp-Tailed Grouse	Piping Plover
California Condor	Buff-Breasted Sandpiper
Swallow-Tailed Kite	Greater Yellow-Legs
Butter-Ball Duck	Hudsonian Godwit
Upland Plover	Marbled Godwit
Golden Plover	Woodcock

The shore birds of the United States now are so far down and out that of the sixteen species originally killed as "game," from 1912 onward, the federal government has at last felt compelled to stop the killing of all of them save the woodcock and snipe. The shore birds listed above are included partly on the strength of up-to-date information derived from the admirable work of Mr. E. H. Forbush, State Ornithologist of Massachusetts, as published in his fine volume, "Birds of Massachusetts," Vol. 1 (1925).

The best index of the awful scarcity of game-birds is to consider the average annual "bag" of game in any state that collects the figures from sportsmen. In 1922–3 the records show that in one "good game state" each of the licensed hunters averaged as his *season's total* bag, for the entire hunting season, one-fourteenth of a wild turkey, five-eighths of a duck, one-fifteenth of a woodcock, one-nineteenth of a goose, five-eighths of a poor little *sora rail*, and one-sixth of a clapper rail. There are other states whose game averages per hunter were quite like the above; and yet in the East there are men who have the hardihood to publish declarations that "game is abundant!"

The reader is invited, and urged, to procure from the U. S. Department of Agriculture a copy of the latest annual "Farmers' Bulletin" of "Game Laws," federal and state, to look under each state at the paragraph headed "No open Season," and then do some figuring on the chances for any killable game to survive. Are not the sportsmen of America determinedly murdering their own sport?

Prospect for the Future.—In view of all conditions in 1927, it now seems highly probable that by 1950 the present "American System" will have exterminated in the United States all game-birds,—and mammals also, save the very few that are given inviolate protection in parks and game sanctuaries. A "preserve" in which game shooting is permitted does not deserve to rank as a real preserve, any more than a penitentiary deserves to rank as a sanitarium.

Causes of Bird Destruction in the United States.

First, and most deadly, stands the forty-eight state armies of hunters who annually take the field, splendidly equipped for killing everything that may lawfully be taken. The grand total of licensed hunters in 1926 was 5,168,353, in addition to which at least 1,000,000 farmers hunted on their own lands without licenses. The deadliness of this stupendous army of wild-life destroyers *far surpasses all other causes combined!*

The Second cause in deadliness is the laws and "regulations" that nearly everywhere permit too much killing per day or season, and for too long periods of time.

The Third cause is the reckless destruction of brush and other cover for wild creatures, and the sources of their food supply. We are quite certain that the "drainage of marshes" has not had one-half so much to do with the decrease of bird life as a few persons claim that it has; but in many places the drying-up of lakes, and the drainage of lakes and ponds has been destructive to the general duck supply.

Great numbers of birds are killed wantonly by heedless boys, by alien pot-hunters, by free-ranging dogs in nesting time, by hunting cats, and by hawks and owls. In Utah and California there are localities wherein the excess of alkali in duck-haunted waters has killed hundreds of thousands of ducks that a liberal supply of fresh water would have saved; but the reports of "millions" so killed seem incredible.

Since 1910 United States lawmakers have passed many new and excellent laws for the better protection and preservation of birds. The most important and far-reaching of these were: The stoppage of the sale of game (1911–12); the stoppage of spring shooting (1912), and the stopping of the use of birds' plumage, of the whole world, for millinery purposes (1913). As important bird species have steadily grown scarce and disappeared, both the federal government and the states have made their protective laws and regulations more stringent,—but sometimes too late to accomplish any results worth while! Some particularly persistent species can be brought back, but the great majority can not be. The long and losing fight of the people of Massachusetts to save and bring back the heath hen may be cited as a typical example of United States methods in "game protection." Some states have spent large sums of money,—usually in vain,—to purchase and import Mexican quail for the restocking of areas of extermination.

Small and tender Mexican quail cannot survive our northern winters; and the ruffed grouse is "impossible" to breed and rear in captivity. The wild turkey can be encouraged to "come back" under ideal conditions; but we think that such conditions are created only by a few private individuals.

Pheasants from the Old World can live and thrive independently in many sections of our country, and now afford hunters as good sport as one can reasonably expect in the shooting of *tame* birds! The Hungarian partridge has "taken hold" in the State of Washington, and in some of the provinces of Canada. However, by far the best way to maintain a supply of game-birds is by protecting our own native species.

Slaughter of Non-Game Birds.—Let all the American people be warned that to the really greedy and savage pot-hunter, no bird is sacred, and no bird is safe. But for protective laws mercilessly enforced, the pot-hunters would kill all our song-birds, woodpeckers, tree protectors, shore birds, herons, and cranes *in about three years!* In 1903 the people of New York City were horrified by the discovery of state game wardens that in one cold-storage warehouse there were,—all contrary to law,—8,058 snow buntings, 288 bobolinks, and 7,607 sand-pipers, along with quantities of real game-birds. For the twenty years or more that the killing of bobolinks as "game" was sanctioned, because of damages inflicted by that bird on the rice crops of the Atlantic coast, at least half a dozen species of song-birds were served in the United States under the name of "reed-bird" (bobolink).

To-day, throughout the United States and Canada, the killing of all song-birds, insectivorous and other non-game birds, is strictly forbidden by the international Bird Treaty Act, but for some strange reason our federal government permits the shooting of the beautiful, migratory, red-winged blackbird *in the District of Columbia*, as a game-bird!

Protect the Birds.—Young reader, learn to-day that the birds are the natural protectors of man and his crops from the hordes of insects which without them ravage leaf, flower and fruit.

But for the hawks and owls, the wild mice and rats soon would multiply into an intolerable pest. But for the insectivorous birds, destroying grubs and perfect insects by the million, the life of the farmer, fruit-grower and forester would be one long battle against the pests of the insect world.

Learn that it is wise to encourage birds, as well as to protect them from slaughter. A little food intelligently bestowed is always accepted as a token of friendship and hospitality. Any country dweller can draw birds around him, if he will. Why grudge a few simple shelter-boxes, a few handfuls of grain, and a few pounds of fat pork when in exchange for them you may have, even in winter's dreariness, the woodpeckers, chickadees, crows, and many other winter "residents" and "visitants"? Surely, no right-hearted man or boy can prefer solitude to the company of cheerful feathered friends.

How we Study Birds.—To-day, in the primary schools, little children learn something of the wild-birds by which they are surrounded. These studies of Nature are but contributions of bricks and mortar toward what must be the complete building. It is now our purpose to lay the foundation for a structure of bird-knowledge which may be built upon all through life, as elaborately as the builder may choose. But, even those who wish to build only one story in height need just as correct a foundation as those who build the highest.

Our purpose now is to offer the student a general introduction to the bird-world of North America, and illustrate its groups by about one hundred prominent types, all so typical and so representative that every one should know them all. Herein, the student is urged to pay special attention to the systematic groups set forth. Once these are permanently fixed in the mind, the detailed study of the different species of birds becomes a genuine joy.

Learn well the various *Orders* of our birds, the prominent *Families*, and the prominent types representing them. Details regarding anatomy, seasonal changes, migration, breeding-habits, distribution and exact food-habits can be sought later on, and found in great abundance in the wealth of beautiful bird-books now available at small cost. In presenting herein the individual birds which have been chosen to represent the different groups, we shall strive to give in a few words an accurate and clearly defined general impression of each, but no more.

Remembering the Orders of Birds.—The birds of North America are divided into seventeen Orders, besides which two additional Orders exist elsewhere. Under different circumstances, the student might find some difficulty in remembering these Orders, and the relations they bear toward each other. In this, however, we find ourselves aided by Nature in a remarkable way.

By a very simple and natural arrangement, with fair regard to the forms and habits of birds, and their haunts upon the earth, it is possible to show upon a chart, the following facts:

1. The various Orders of North American birds;

2. The relative size of each Order, in number of species;

3. The haunts of each Order, on land or water, and

4. Approximately, the rank of each order, from lowest to highest.

On the accompanying chart of bird-life, an ideal panorama of land and water is divided between the various Orders of North American birds, just as we find them in Nature. By a fortunate coincidence, the Orders that are lowest in the scale of natural classification are those containing the sea-birds, of deep water, which therefore belong at the bottom of the chart. On the other hand, the birds that are highest in the zoological scale—the perching birds—are also the birds of the tree-tops, and must be placed at the top of the chart.

The birds of the shore, the river-bank, and the uplands have their respective areas in the middle portion of the scale, and we are thus enabled to see almost at a glance the geography of the bird-world, at least as we find it in North America.

Beginning with the highest, we shall endeavor to point out the leading characters of the various Orders, and the examples which best represent them. Just at present, however, it is not wise for the student to go too far into the subdivisions of the Orders, and only the most important Families will be mentioned by name.

Any student who is unwilling to devote a few hours to learning the names and places of the

various Orders of birds may as well refrain from attempting to know our feathered friends; for that knowledge is quite as necessary as foundation-stones are to a tall building. *The names of the Orders must be learned, and remembered!* For the purpose of making the contents of each Order familiar to the reader, representatives of the most important Families it contains will be mentioned, and illustrated by the presentation of at least one species.

THE ORDERS OF LIVING BIRDS.

ORDER.	PRONUNCIATION.	CHARACTER OF BIRDS INCLUDED.	EXAMPLES.
PASSERES	*Pas'se-rez*	Perching-Birds	Robin, Warbler and Jay.
MACROCHIRES	*Mac-ro-chi'rez*	Goatsuckers, Swifts and Humming-Birds	Nighthawk, Swift, Ruby-Throat.
PSITTACI	*Sit'ta-si*	Parrots and Macaws	Carolina Parakeet, Macaw.
PICI	*Pi'si*	Woodpeckers	Golden-Winged Woodpecker.
COCCYGES	*Coc'si-gez*	Cuckoos and Kingfishers	Belted Kingfisher, Cuckoo.
RAPTORES	*Rap-to'rez*	Birds of Prey	Eagle, Owl and Vulture.
COLUMBAE	*Co-lum'be*	Pigeons and Doves	Band-Tailed Pigeon, Mourning-Dove.
GALLINAE	*Gal-li'ne*	Scratching-Birds	Quail, Grouse, Wild-Turkey.
LIMICOLAE	*Li-mic'o-le*	Shore-Birds	Plover, Woodcock, Snipe.
PALUDICOLAE	*Pal-u-dik'o-le*	Cranes and Rails	Whooping Crane, Virginia Rail.
HERODIONES	*Her-o-de-o'nez*	Herons and Egrets	Great Blue Heron, Snowy Egret
ODONTOGLOSSAE	*O-don-to-glos'se*	Flamingoes	American Flamingo.
ANSERES	*An'se-rez*	Swimmers with Comb-Edge Bills	Mallard, Canada Goose, Swan.
STEGANOPODES	*Steg-a-nop'o-dez*	Fully-Webbed Swimmers	Pelican, Darter, Cormorant.
TUBINARES	*Tu-bi-na'rez*	Tube-Nosed Swimmers	Albatross.
LONGIPENNES	*Lon-gi-pen'nez*	Long-Winged Swimmers	Gull and Tern.
PYGOPODES	*Py-gop'o-dez*	Diving-Birds	Loon, Grebe, Auk, Murre
IMPENNES	*Im-pen'-ez*	Flightless Divers	Penguin.
RATITAE	*Ra-ti'te*	Flightless Runners	Ostrich, Cassowary.

EXPLANATION OF THE CHART OF THE ORDERS OF NORTH AMERICAN BIRDS.

The Orders of North American birds lend themselves with gratifying readiness to the purposes of a landscape chart. In this way more than any other known to the author can the greatest number of facts regarding the Orders and their relationships be set forth in a manner easily understood, and calculated to appeal to the eye.

As with the mammals, the highest Orders are found in the tree-tops and the air; and as nearly as possible the relative sizes of the various Orders are shown. The birds of the highest and most perfect organization appear at the top of the chart, and the lowest forms are those of deep water, farthest from the land.

The great size of the Order Passeres is strikingly apparent; and it is situated in the tree-tops where its members live.

The curious shape of the Order Macrochires is due to the fact that the Goatsuckers, Swifts and Humming-Birds have so little in common that they are wellnigh separated; but the larger body—the Hummers—are closely related to the Perching-Birds.

The Order Coccyges is composed of two groups equally ill matched, the Cuckoos and Kingfishers. The former touch the Perching-Birds, the latter the sharp-beaked fishers; but the association of the two in one Order is not satisfactory, and not likely to stand.

The Orders Columbae, Gallinae and Paludicolae are found on the uplands, immediately above the Limicolae, or Shore-Birds.

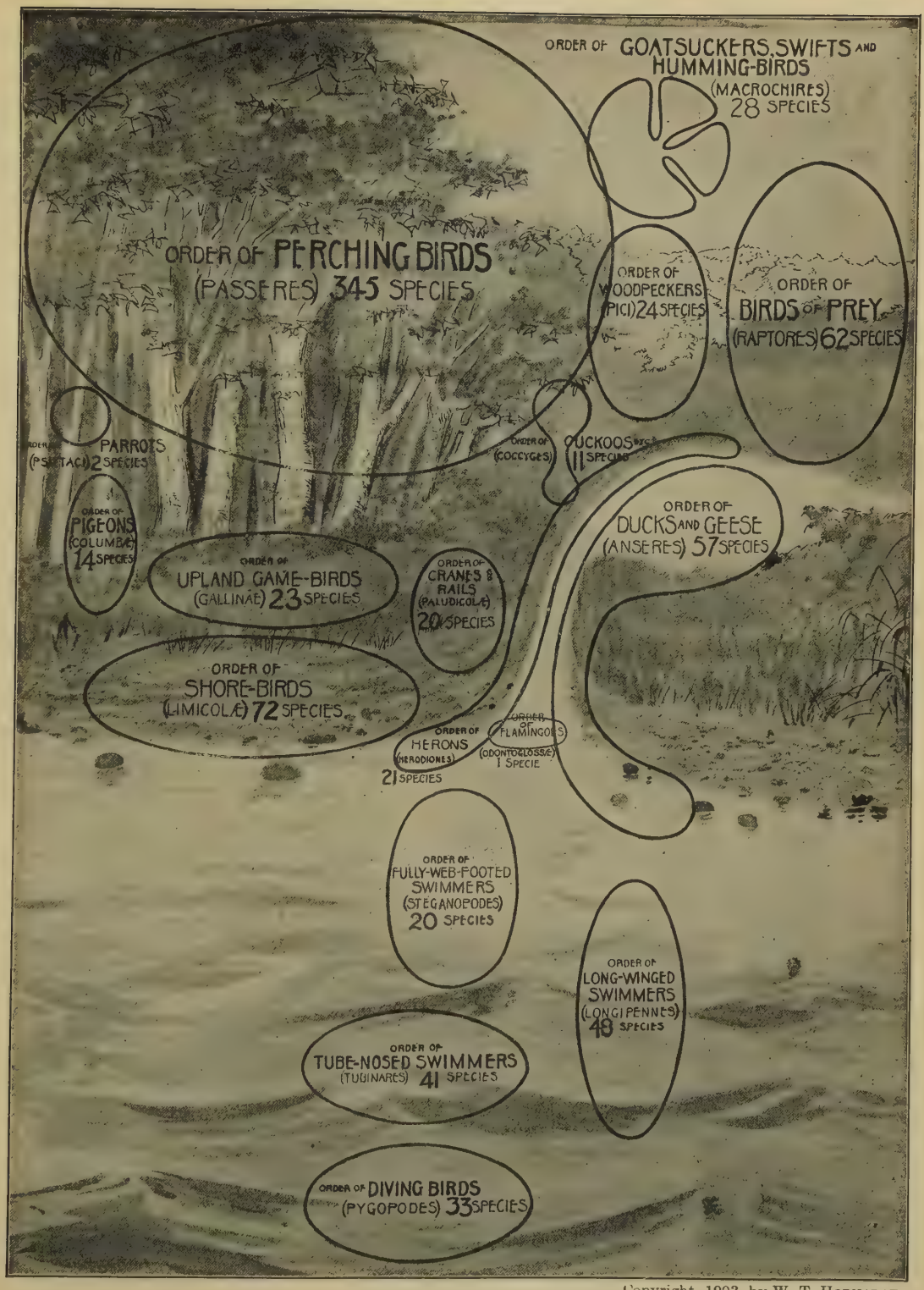
The Herodiones (Herons, Egrets and Bitterns) range along the shore from the sea, up the river, to the interior lake, while the Anseres—Ducks and Geese—cover lake, river and sea.

The Flamingo's Order—Odontoglossae—is of the shallow water of an estuary, connecting the Herons and Ducks.

The Steganopodes (Cormorants, Pelicans, etc.) prefer the shallow waters of the sea, while the Gulls and Terns (Longipennes) range from shallow to deep waters.

The Tubinares (Albatrosses, Fulmars, etc.) and Pygopodes (Auks, Murres, and other weak-winged divers) are birds of deep water.

For obvious reasons, it has not been considered a practicable matter to include on a landscape chart the birds of the world, or even those of South America.


ORDER OF GOATSUCKERS, SWIFTS AND HUMMING-BIRDS (MACROCHIRES) 28 SPECIES
ORDER OF PERCHING BIRDS (PASSERES) 345 SPECIES
ORDER OF WOODPECKERS (PICI) 24 SPECIES
ORDER OF BIRDS OF PREY (RAPTORES) 62 SPECIES
PARROTS (PSITTACI) 2 SPECIES
ORDER OF CUCKOOS (COCCYGES) 11 SPECIES
ORDER OF PIGEONS (COLUMBÆ) 14 SPECIES
ORDER OF DUCKS AND GEESE (ANSERES) 57 SPECIES
ORDER OF UPLAND GAME-BIRDS (GALLINÆ) 23 SPECIES
ORDER OF CRANES & RAILS (PALUDICOLÆ) 20 SPECIES
ORDER OF SHORE-BIRDS (LIMICOLÆ) 72 SPECIES
ORDER OF HERONS (HERODIONES) 21 SPECIES
ORDER OF FLAMINGOES (ODONTOGLOSSÆ) 1 SPECIE
ORDER OF FULLY-WEB-FOOTED SWIMMERS (STEGANOPODES) 20 SPECIES
ORDER OF LONG-WINGED SWIMMERS (LONGIPENNES) 48 SPECIES
ORDER OF TUBE-NOSED SWIMMERS (TUBINARES) 41 SPECIES
ORDER OF DIVING BIRDS (PYGOPODES) 33 SPECIES

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LANDSCAPE CHART OF THE ORDERS OF NORTH AMERICAN BIRDS.

THE BOBOLINK IN SPRING.

No longer shot by sportsmen as a game-bird.

CHAPTER XVI

THE ORDER OF PERCHERS AND SINGERS

PASSERES

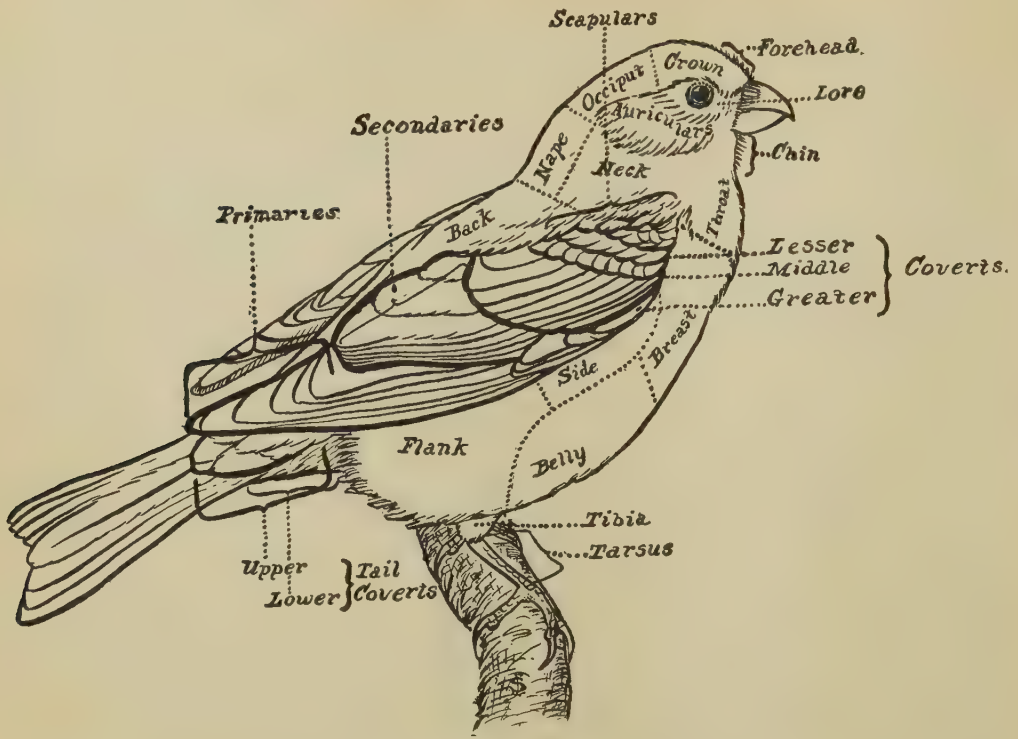
This Order is the highest in the scale of birds, and it is by far the largest of the whole nineteen Orders. In the zone of agriculture it contains the birds which are of the greatest importance to mankind, the insect-eaters. It also contains all the real song-birds of the world, and its North American Families are as shown below:

	FAMILIES.	SCIENTIFIC NAMES.	EXAMPLES.
ORDER PASSERES.	THRUSHES,	*TUR'DI-DAE,*	Robin, Thrush, Bluebird.
	KINGLETS,	*SYL-VI'I-DAE,*	Kinglet and Gnatcatcher.
	NUTHATCHES,	*PA'RI-DAE,*	Nuthatch, Chickadee, Titmouse.
	TREE-CREEPERS,	*CER-THI'I-DAE,*	Brown Creeper.
	DIPPERS,	*CIN'CLI-DAE,*	Water-Ouzel.
	WRENS,	*TRO-GLO-DY'TI-DAE,*	Wren, Cat-Bird, Mocking-Bird, Thrasher.
	WAGTAILS,	*MOT-A-CIL'LI-DAE,*	Wagtail and Pipit.
	WARBLERS,	*MNI-O-TIL'TI-DAE,*	Warbler, Water-Thrush, Redstart, Chat.
	VIREOS,	*VI-RE-ON'I-DAE,*	Red-Eyed Vireo.
	SHRIKES,	*LAN-I'I-DAE,*	Butcher-Bird and Loggerhead Shrike.
	WAXWINGS,	*AM-PEL'I-DAE,*	Bohemian Waxwing, Cedar-Bird.
	SWALLOWS,	*HI'RUN-DIN'I-DAE,*	Swallow and Martin.
	TANAGERS,	*TAN-A-GRI'DAE,*	Scarlet Tanager.
	FINCHES,	*FRIN-GIL'LI-DAE,*	Sparrow, Finch, Grosbeak, Cardinal, Snow-Bunting, Redpoll.
	BLACKBIRDS,	*IC-TER'I-DAE.*	Blackbird, Oriole, Meadow-Lark, Bobolink.
	CROWS,	*COR'VI-DAE,*	Crow, Raven, Jay, Nut-Cracker.
	HORNED LARKS,	*A-LAU'DI-DAE,*	Horned Lark.
	FLYCATCHERS,	*TY-RAN'NI-DAE,*	Flycatcher, Pewee, Phœbe, Kingbird.

The majority of perchers are birds of plain feather, quite as if Nature had intended that these, the best friends of the farmer and fruit-grower, should be the last to be destroyed by the merciless Man-With-a-Gun.

It will be a sad day for the American farmer when the last insect-eating bird of our country is brought fluttering and lifeless to the ground. When the armies of destroying insects begin to multiply unchecked, and send forth their millions and tens of millions, then will the husbandman realize the value of the allies he has lost, and vainly wish to exchange any number of grapes and cherries for the once-despised robin, thrush and blackbird.

Quite apart from their cash value to the agriculturist, it is the song-birds that appeal most strongly to the ear and heart of man. Even the exquisite plumage of the resplendent trogon, most beautiful of all American birds, does not thrill the soul as does the song of the robin, the brown thrasher and the mocking-bird. Next to sunshine and green verdure, the most cheering thing in Nature is the song of a bird. At this moment (early spring) a robin, in the big maple in front of my windows, is pouring forth a song that is at once restful and inspiring. It reminds me that we who live in the temperate zone are *greatly favored* by the presence in our bird-life of the sweetest singers in the world. Shall



THE PARTS AND PLUMAGE OF A PERCHING-BIRD.

we, then, be so utterly barbarous and mean as to engage in, or permit, the killing of our song-birds in order that they be used either as food for biped pigs, or to adorn(?) the cheap millinery of servant-girls? Never!

Let it not be thought, however, that the Order Passeres has not a good share of birds of beautiful plumage. In our own fields and forests, behold the waxwing, the oriole, the cardinal, the tanager, the grosbeak, the magpie, the jay and the bobolink. The tropics contain the wonderful birds of paradise, and a bewildering array of humming-birds, cotingas, finches, ground-thrushes and many others.

If the temperate zone lacks anything in perching-birds of brilliant plumage, that lack is more than made up by the singing-birds. With all its wealth of bird-life, brilliant and plain, the tropics are generally silent, and a joyous or musical bird-song is rarely heard. Of the bird-cries that one occasionally hears, the majority are harsh and unpleasant squawks. The tropical day has neither robin nor mocking-bird, the night no whippoorwill. True, there is the awful "brain-fever" bird of the Indian night, but it is neither musical nor joyous. One may spend months in the tropics, both of America and of the Far East, and in all that time hear less of real bird-song than can be heard on many an American farm in one day.

As might be expected in a large Order of birds, the food habits of the perchers cover a wide variety of foods. The great majority prefer to live upon insects, and the young of all species are absolutely dependent upon soft-bodied insects, larvae and earth-worms. Many birds are really limited to insect-food, and can subsist on no other kind. Next in importance, and for the longest period, perhaps, come seeds and grain, especially the seeds of weeds that are a pest to the farmer. As a rule, fruit is taken in its brief season more as a dessert than as a staff of life.

A very few species, like the crow, magpie and jay, eat meat whenever opportunity offers it, and welcome the discovery of raw meat or eggs.

The great value of the perching-birds lies in the enormous quantities of insects which they con-

sume as food.[1] These birds have been specially developed by Nature to combat and destroy the hordes of insects destructive to fruit, grain and tree life, which otherwise would in a short time increase to such enormous numbers that no vegetation could withstand their attacks.

To young pupils, the Order of Perching and Singing Birds may at first seem difficult to grasp; but in reality it is not. A knowledge of forty birds will give one a very good idea of its various Families; and any one can learn about forty birds. After this Order has been mastered, all others will be found quite easy. The examples introduced have been selected with great care, and concerning those illustrated, the pictures will tell of their forms and markings far better than wordy descriptions could do.

THE THRUSH FAMILY.

Turdidae.

The Robin.[2]—All lovers of birds should agree in placing this dear old friend at the head of the list of the birds of this continent. This is because it is the highest avian type. It has typical plumage, it flies well, it perches, it sings beautifully, it migrates, and its anatomy is thoroughly representative. Moreover, it quickly discerns a friend and protector, and it is not driven away by the English sparrow.

Of all our birds, the Robin comes the nearest to being "folks." It is always one of the first birds to arrive in the spring, it remains all summer, and it is one of the last to depart at the approach of winter. Often the late spring snows catch it on its early migration, and its staying powers are put to the test. It is a good plan to scatter food for these early birds. Nothing save the sun itself is more gladdening on a raw March day than the joyous note by which the Robin announces the arrival of himself and spring.

Who is there who can know the Robin and not love him? Few indeed; and those persons around New York and in some parts of the South who shoot Robins for food, are wholly unfit to inhabit the Robin's country, unless they reform.[3]

The Robin is one of the sweetest and most joyous songsters I know. As well try to describe the glories of a sunset as to set forth in words the liquid melody, clear and sweet, which pours from his throat when he feels particularly joyous.

Everywhere, the Robin is a very sociable bird, and exceeding quick to distinguish a friend from a foe. Give it absolute protection, and security from cats, and it will cheerfully nest on your window-sill. This is what one actually did in Buffalo, under our roof,—built her nest on the sill of an upper window, close against the glass, and reared her brood there. We went many times to see

ROBIN.

how she was getting on, and she, knowing well that glass is a barrier, permitted us to put our faces within two inches of her head.

In the Zoological Park, the Robins were the first wild creatures to learn, in 1900, that the reign of the poacher was over; and they quickly told it to the crows, and thrushes, and other birds. In an eight-foot pine-tree, that was

[1] The Biological Survey of the United States Department of Agriculture has published many important bulletins and shorter papers on the food habits of our birds, with especial reference to the species either most beneficial or most harmful to the farmer and fruit-grower. A list of those now available, and the terms on which they are procurable, will be furnished by the Department upon application.

[2] *Me-ru'la mi-gra-to'ri-a.* Length, from end of beak to end of tail, 9 to 10 inches.

[3] In central Tennessee are large tracts of cedars, the berries of which serve to attract myriads of Robins in the winter. Previous to the enactment of our migratory bird treaty with Canada, one small hamlet in this district sent to market annually enough Robins to return $500, *at five cents per dozen*, equal to 120,000 birds. They were killed at night by torchlight, with sticks. An officer of the Louisiana Audubon Society stated that a conservative estimate of the number annually killed in Louisiana for food purposes was a *quarter of a million* when they were usually plentiful.

planted six feet from the edge of the main walk, and directly in front of our head-quarters, a Robin built her nest, only five feet from the ground; and there she reared her young. To many visitors who loved birds, her nest was shown, but to the Robin-killers and the nest-robbers no one said a word. On Gardiner's Island, where cats live not, the Robins nest on fence-rails only two feet from the ground, in full view of the bird-loving inhabitants of that small world.

WOOD-THRUSH.

Often we have been greatly interested by the keenness of sight of the Robins which visit our lawn. After every shower, certain Robins of our acquaintance take possession of the lawn, and stride over the grass with an air of great importance and earnestness of purpose. After several wise and sidewise cocks of the head, a Robin will suddenly drive his bill far down into the grass, and brace himself for a hard struggle. By dint of many hard tugs, out comes the earthworm, to be borne away in triumph to a certain nest. Often I have tried to see worms down among the roots of the grass, as the Robins do, but never once have I succeeded. Evidently my objectives never were focused just right for worms in green grass.

In all save a very few localities in North America, the Robins are treated as friends. In the "grape belt" of western New York, they are a great annoyance to some grape-growers because of the bunches they disfigure. Elsewhere they are of great benefit to farmers, and the few cherries they take in cherry time are very modest compensation for the noxious grubs they pick out of the freshly ploughed fields.

The investigations of the Biological Survey of the Department of Agriculture have demonstrated the great economic value of the Robin as a destroyer of harmful insects. The contents of three hundred and thirty stomachs of birds taken in all seasons revealed the fact that in the course of an entire year, insects make up 40 per cent of the food of Robins, wild fruit 43 per cent, cultivated fruit 8 per cent, and miscellaneous vegetable food 5 per cent.

Regarding the killing of Robins, and other song-birds, and also doves, as food for man in a land of plenty, there cannot be two opinions. It is not necessary; it is not "sport"; it is very injurious to our farmers and fruit-growers, and entirely reprehensible. No self-respecting boy or man can be guilty of such wrong-doing; no civilized community should tolerate it for one moment, and *no farmer can afford to permit it!* I would rather that any friend of mine should be caught stealing a sheep than killing Robins, either for food or "sport."

Let us protect the great American Robin, *and all other perching-birds,* even at the point of the bayonet if it be necessary.

The Wood-Thrush[1] is one-fifth smaller than a robin, and is easily recognized anywhere by its beautifully spotted breast. It has about fifty dark-brown spots, often arranged in rows up and down its breast, belly and throat, on a creamy-white ground color. Other thrushes have dark spots on the breast, but not down to the legs. The head and shoulders of this bird are of a bright cinnamon color.

This graceful creature often works overtime to make the woods melodious, and it is one of our sweetest singers. It is not so bold and confident as the robin, and is much given to following the robin's lead. Its favorite haunt is the sweet seclusion of shady woods and thickets, where the half-bare earth affords good hunting-grounds, and a fair degree of safety from observation. Its nesting habits are very much like those of the robin, and its range includes the whole eastern half of the United States, to the Great Plains beyond the Mississippi.

The Common Bluebird.[2] — The United

[1] *Hy-lo-ci'chla mus-tel-i'na.* Length, 8 inches.
[2] *Si-a'li-a si-a'lis.* Length, 6.75 inches.

States is a country of such vast extent it is a physical mosaic of different elevations, soils, and climates. Roughly speaking, these are its physical divisions:

1. The *eastern half*, of ideal rainfall, bountiful harvests, and abundant shade.

2. The *Great Plains*, fine for grazing, but mostly too dry for agriculture.

3. The *Rocky Mountain region*, embracing a perfect medley of physical conditions, mostly high, rugged, and rather lacking in insect-life.

4. The *arid regions*, of the country between the Rockies and Sierra Nevadas, extending from southern Washington to the City of Mexico, and including southern California.

5. The *region of great rainfall*, on the northwestern Pacific coast (northern California, Oregon and Washington).

It is not strange, therefore, that we find typical species of eastern animals developing westward into different colors, and also different pelage, and designated scientifically by different names. Take these examples by way of illustration:

In the East we have the *Common Bluebird.*

In the Rockies we have the *Chestnut-Backed Bluebird*, and also the *Mountain Bluebird.*

In Arizona we have the *Azure Bluebird.*

In the Pacific states we have the *Western Bluebird*,

And in Lower California, the *San Pedro Bluebird.*

Is it at all necessary that the general student should know about all these different species in order to not be accounted ignorant? Let us see.

Any sensible civilized person knows a cow at sight, also something of its place in Nature, and its habits. No one, however, save the special student of domestic cattle, is expected to be able to say, without "looking it up," whether a particular cow is an Alderney, a Jersey, a Short-Horn, a Hereford, or a Durham.

The case of the Bluebird is quite similar. He who knows one Bluebird well, may justly claim a bowing acquaintance with all the others, and feel at home when in their company.

Here in the East, the Bluebird is a thing of beauty, and a joy until the abominable English sparrows drive it away. It comes with the robin, to help chase winter away; and though we have heard it a hundred times, it is always welcome news, late in February or early in March, to hear some one say triumphantly, "I saw a Bluebird to-day!" It is as needless to describe this feathered beauty, with the brown breast, and back of heaven's bluest sky-tint, as it would be to describe a rainbow.

Unfortunately, the Bluebirds are not good fighters, and the English sparrows harry them shamefully. They are timid, and easily driven away. Worse than this, they are easily killed by cold weather. The cold wave which visited the South in 1895 killed so many thousands of Bluebirds, especially in North Carolina and Arkansas, that for some time afterward the number visible in the North was alarmingly small. If not molested by the English sparrow, the Blue-

BLUEBIRD.

bird takes readily to boxes erected on poles near farm-houses, similar to those frequently erected by the farmer boys to attract the purple marten. A good way to encourage robins and Bluebirds is to kill the English sparrows.

THE KINGLET FAMILY.

Sylvidae.

The Ruby-Crowned Kinglet[1] is one of our smallest birds, and it is easily recognized by the tiny tuft of ruby-red feathers on the crown of its

[1] *Reg'u-lus cal-en-du'la.* Length, 4.25 inches.

RUBY-CROWNED KINGLET.

head. In life it is a dainty little feathered gem, but it is so modest and retiring that it is seen only by sharp eyes. "Kinglet" means "Little King." Mrs. Mabel Osgood Wright testifies strongly to its value as an insect-destroyer, especially in the late autumn, when other insectivorous birds have gone, when it works industriously upon the trunks of evergreens. Dr. Coues considered the Kinglet an exquisite singer, but I must confess that its vocal powers have quite escaped me.

THE NUTHATCH AND TITMOUSE FAMILY.

Paridae.

The birds of this Family deserve to rank as prime favorites. They remain with us through "the long and dreary winter," when all save a corporal's squad of the grand army of birds have fled southward, and left us to our fate. They are exceedingly industrious, and their efforts are directed against insects of very destructive habits, the tree-borer and the bark-louse. In their work they are not continually "playing to the gallery," and telling people how busy they are.

The Chickadee, or **Black-Capped Titmouse,**[1] is one of the dearest little fellows that flies. It always reminds me of a forest-elf, in a black cap and a feather cloak. Instead of making a great show of fright, like a girl in the presence of a ferocious mouse, little Black-Cap perches on a tiny twig growing low down on the trunk of a big tree, and cocks his head at you, while he looks you over with a fraternizing air. His attitude and manner say as plainly as English, "You are a good fellow, and I'm another. We understand each other perfectly, don't we?"

And then his greeting. If you have never before had the pleasure of meeting him, he pipes out cheerily, "CHICK-a-dee-dee-*deé!*" Watch for him the next time you go into the woods in winter,—a jet-black cap with a white waistcoat below it; a black necktie, bluish-gray overcoat, and a very pert and saucy air. You can hardly fail to recognize him, but in case you hesitate, and think his "face is familiar," he will up and tell you his name, as plainly as print.

CHICKADEE.

[1] *Pa'rus at-ri-cap'il-lus.* Length, 5.25 inches.

Six well-marked types and several races of Chickadees inhabit North America from Alaska to Mexico, but the one most widely known is that just named.

The White-Breasted Nuthatch[1] deserves the most perfect protection and encouragement that the people of this country know how to offer. One good look at this bird on the trunk of a valuable tree, searching as if with a magnifying glass for the trees' deadly enemies,—the borers,—ought to convert any person to the cause of bird-protection. Like the chickadee, the Nuthatch remains in the north all winter, because he feels that he has not a moment to lose in his war on the borers.

The tree-trunks are his favorite hunting-ground, and he goes over them, literally inch by inch. He becomes so absorbed in his work that he forgets all about himself, and works half the time head downward, or oblique, or horizontal, as it may happen to be. Rarely does he stop to talk, and even then he only clucks in his throat, "not necessarily for publication, but as a guarantee of good faith."

Often in the silent and snowy woods, when your feet go *rip! rip! rip!* through the frozen crust, you hear close overhead a scratching, digging sound, as of some one gouging into rough bark with a pocket-knife. Look up, and it will be a Nuthatch, working away as if his job depended upon the doing of a daily stint. He thinks that in his case it is the late bird that catches the worm! His beak is like that of a small woodpecker, and although his friend the chickadee has more style than he, he himself is much better fitted for digging in bark. The top of his head is black, his sides, throat and breast are pure white, while his back is dull blue, or gray-blue. As a climber, this bird surpasses the woodpecker, because in clinging to a tree-trunk it makes no use of its tail.

Nuthatches are easily encouraged to make your trees their head-quarters. In December, nail to a tree-trunk here and there, about twelve feet from the ground, some lumps of suet, or fat pork on the rind, or beef bones with a little raw meat upon them, and see how quickly the birds find them out. The "winter residents" will feast upon them until the last morsel has disappeared, and they will appreciate your thoughtfulness thus displayed precisely when tree-borers burrow deepest, and are most difficult to get at.

[1] *Sit'ta carolinensis.* Length, about 6 inches.

THE TREE-CREEPER FAMILY.

Certhiidae.

The Brown Creeper[2] represents a small Family of small birds of tree-climbing habits, but with bills that are rather too slender for work in bark. They are not fitted by nature for digging a modest and retiring borer from the bottom of his tunnel, and therefore they make a specialty of bark-lice and other surface wood-workers which can be picked off without hard digging.

As an example of protective coloration, this

WHITE-BREASTED NUTHATCH.

little creature is worthy of special note. Its back is brown, marked by about twelve broad stripes of dull gray, and between the two colors the striations of bark are surprisingly well imitated. On the side of an oak, or elm, or chestnut, this little bird is almost invisible until it moves. It does not work head downward, like the nuthatch, but creeps about with its head up, braced by its tail, like a woodpecker. Like

[2] *Cer'thi-a fa-mil-i-ar'is americanus.* Length, 5½ inches.

both the preceding species, it is a winter resident, and in fact is not much in evidence at any other season. The four species of this group cover the United States, and extend from Alaska to Guatemala.

THE WRENS AND CAT-BIRDS.

Troglodytidae.

In some respects, the wrens are but a short step from the tree-creepers, but in others they are widely apart. For its size the **House-Wren**[1]

BROWN CREEPER.

is the most pert and saucy bird in North America. Forty years ago, a pair of these merry little sprites took up their abode in the wild fastnesses of the grape-arbor that sheltered our well; and I can hear their shrill chatter yet. It was like the piping of a piccolo. For eight years, they and their children and grandchildren possessed the outskirts of our dwelling, and it was a great day when we discovered a beautiful, feather-lined nest, nearly six inches deep, that the Wrens had built in an old-fashioned lantern that hung in the wood-house. I wish it were possible to have Wrens around a city dwelling, or in a Zoological Park.

A Wren is known by the way it carries its tail, so very straight up in the air that sometimes it tilts forward. The House-Wren is the most sociable of all our wild birds, and also the one most confident of its place in the hearts of its countrymen. I never knew of a Wren being killed by any one save a collector of bird-skins. As for myself, I would go Wrenless forever rather than take the life of a creature so winsome and trustful. Even the cats of our household used to respect the family Wrens. In the country, where there are no English sparrows, it is easy to attract these interesting birds by putting up nesting-boxes for them. Five species of Wrens occupy the United States, from ocean to ocean, the Pacific species, west of the Rockies, being the *Tulè Wren*.

The Brown Thrasher.[2] — Vocally, this bird is practically the northern understudy of the mocking-bird. When, after a warm spring shower and a sudden burst of sunshine, an able-bodied Brown Thrasher perches on the tip-top of a red-haw bush, and for fifteen minutes pours forth a steady stream of delicious melody, in bewildering variations, one is tempted to declare that no mocking-bird can surpass it. It is simply indescribable. Often when sadly toiling in the Iowa fields, I have been stopped and held by this feathered spellbinder for what seemed to my brothers like very long intervals.

In form this bird is very much like the mocking-bird, but its back is colored a rich iron-rust brown, and its under surface is dull white, strongly spotted with large, triangular brown spots. Its home is the whole of the United States east of the Rocky Mountains, and it is the sweetest singer of the North. Unfortunately, its song-period is rather short, and terminates about the end of June.

The Cat-Bird[3] of the North bears a strong resemblance to the mocking-bird, in form, color and movement. It is also a good singer, though hardly in the same class as its southern relative. It is very sociable in its habits, and loves the orchards, gardens, fruit-trees, and berry-bushes of the country dweller. Its name is derived from its favorite exclamatory cry, which sounds

[1] *Tro-glo-dy'tes ae'don.* Length, 4.75 to 5.25 inches.

[2] *Har-po-rhyn'chus ru'fus.* Length, 11.25 inches.

[3] *Gal-e-os-cop'tes carolinensis.* Length, 8.75 inches.

HOUSE-WREN.

like the plaintive mew of a half-grown kitten. Its prevailing color is dark, slaty gray.

The Mocking-Bird,[1] of the states south of the Ohio River, is a singing wonder. It is a little bundle of nerves, covered with modest drab feathers, and its throat is tuned up to concert pitch. When it is silent, it can be recognized by its slender body, long legs and long tail; but when it is singing, only a deaf man needs an introduction. This bird can also be recognized by its nervous and irregular movements, hopping and darting about, up, down and sidewise. If the Mocker feels well, he sings as he darts about, as jerkily and impulsively as he moves.

The Mocking-Bird loves to sing almost as well as some persons love to hear him. His typical song is a bewildering medley of warbling, chirping and twittering, many passages being very clever imitations of other birds, but the majority of it is improvised for the occasion. Next to the marvellous variety of his vocal exercises is the clearness and sweetness of his notes; for this singer never sharps nor flats. The amount and variety of the melody that comes from that insignificant little gray midget in feathers are truly marvellous. Every person who has heard the free, wild bird performing in its home thicket knows that the singing of caged specimens is but a spiritless imitation of the wild song.

Strange to say, this bird not only sings in the daytime, but there are periods, especially during the breeding season, when the male sings at night.

As usual, man's destructiveness reaches out for this the greatest of all American singers Thousands of nestlings are caged, the majority of them in Louisiana. Those that do not die in the process of rearing, live for brief periods in wretched little 12 by 14-inch cages, and die without having known one happy, joyous hour. It is reported that in most portions of the South, the Mocking-Birds are rapidly decreasing in number, especially in Arkansas. The killing of a bird of this species, on any pretext, should be made a penal offence.

THE DIPPER FAMILY.

Cinclidae.

The Water-Ouze', or **Dipper,**[2] is one of the most remarkable little birds on this continent.

CAT-BIRD.

It is a genuine water-elf, and the things it can do are almost beyond belief. I first saw it in late

[1] *Mi'mus pol-y-glot'tos.* Length, about 10 inches.

[2] *Cin'clus mex-i-can'us.* Length, about 8 inches.

November, on the strip of ice which fringed the edge of the roaring, swirling, icy-cold water which plunges into the Shoshone Canyon at the forks of the Shoshone River. Man or beast stepping into that foaming torrent would have been crushed against the rocks, and drowned at the

MOCKING-BIRD.

same moment,—two deaths in one. In that grim and terrible solitude, fast in the embrace of early winter, we saw on the snow-white brink of the ice-bank a tiny dark object, which closer inspection revealed to be a bird. It looked like a large gray wren.

As we paused to regard it, it blithely flew down into mid-stream, and dived head foremost into a chilly wave that ran ten miles an hour. An instant later it reappeared, all unruffled and unwet, blithely flew back to the edge of the ice, and alighted once more. Then we knew well what it was; for it could be nothing else than the Water-Ouzel. Afterward, we saw others along the line of the Denver & Rio Grande Railway where it winds its way through the Rocky Mountains. Where the walls of the Royal Gorge almost crowd the train into the Arkansas River is a good place to watch for them.

This bird is a *diving thrush!* Nature has fitted it to dive boldly into the coldest and most turbulent water, or through a water-fall, and even to walk on the bottom of a still pool, without being at all disturbed. Both in form and size this little creature is like a large wren, but it is so peculiar it occupies a genus quite alone. Of course it is not web-footed; and in appearance it exhibits not one feature suggestive of a semi-aquatic life. Its home is along the foaming torrents of the Rocky Mountains, and Sierra Nevadas, from Alaska to Guatemala. It nests close beside swift-running streams, sometimes beside or even behind a cascade. It is known that this strange bird gives forth a song both clear and sweet, but I have never seen one elsewhere than near a roaring torrent, where no ordinary bird-song could be heard.

THE WARBLER FAMILY.

Mniotiltidae.

From the middle of April to the middle of September, the woods and thickets of the northern states are inhabited by a very considerable number of tiny bird-forms. They are trim-built little creatures, quiet and business-like, and they take themselves very seriously. A few of them are clad in refined shades of yellow, but—most fortunately—the great majority wear dull olive, gray or brown colors, and thereby escape the hostile attention that bright plumage always attracts.

These are the warblers, grand in the destruction of insects, but the most elusive and difficult little creatures with which bird-students have to deal.

The difficulty lies in studying them effectively without killing them. As for myself, I have not yet seen the day wherein I could find myself willing to slaughter from five hundred to a thousand of these exquisite little creatures for the sake of becoming sufficiently acquainted with them to name them *when they are dead!* I blush not in admitting that I have gone half way through life knowing less than a score of warblers to the point of naming them, accurately, as they fly before me. My exhortation to all young people is—*do not slaughter birds, of any kind, merely to become acquainted with their names.* Some of the wild flowers can endure that method without extermination, but the wild birds and mammals cannot.

It is *not at all essential* that such tiny, inconspicuous creatures as warblers should be recognized and correctly named at sight. Already a million warblers have died to make holidays for collectors. Not long since I received from an egg-dealer a circular advertising the following eggs for sale:

Worm-Eating Warbler....	84 sets,	416 eggs.
Yellow Warbler.....	94 "	388 "
Oven-Bird.....	105 "	458 "
Yellow-Breasted Chat.....	139 "	521 "
Kentucky Warbler.....	210 "	917 "
Total for 51 species. .	1,274 sets,	5,433 eggs.

It is such wanton destruction as this which makes me "down" on egg-collecting. It is safe to say that the taking of those 5,433 warbler eggs, robbed the farms and forests of New York state of that number of useful birds, not counting possible progeny, and did not one dollar's worth of good to the "cause of science," or any other public interest. Already, poor "Science" has an awful load of crimes against Nature to answer for. Do not add to it without very strong justification.

The members of the Warbler Family, commonly called wood warblers, are distributed all over North America, wherever insects abound, from the southern edge of the arctic Barren Grounds to southern Mexico. In her very scholarly and useful book entitled "Birds of the Western United States," Mrs. Florence Merriam Bailey enumerates forty species; and Mr. Frank M. Chapman, in his "Birds of Eastern North America," gives fifty-two. Of these, however, twenty-one are duplicated, and therefore the whole number of warblers described in the two handbooks is seventy-one. When we consider the fact that about sixty of those species are very small birds, of uniform size, and many of them quite unmarked by striking special colors, the difficulty of becoming acquainted with the different species will begin to appear. For present purposes, the whole Family can be very fairly represented by three species. Two of them are of universal distribution, and the third (the chat) is nearly so.

The Yellow Warbler, or **Summer Yellow-bird,**[1] is chosen as the type of about sixty species of small wood warblers each of which is called "Warbler" with a descriptive name prefixed, such as palm warbler, prairie warbler, Calaveras warbler, etc. It is of a bright, greenish-yellow color, and is easily recognized on the wing. On the Western prairie farms, the boys call it a "Wild Canary," because it strongly resembles the orange yellow phases of that popular cage-bird. As if courting acquaintance with man, it loves to frequent the roadside thickets, the edges of woods, and even the orchard and garden.

The beauty of this bird far surpasses its minstrelsy, for it is but an indifferent singer. The fact is, however, that it has so much work to do in catching insects it has little time for music; for it will be noticed throughout the bird-world that the most diligent insect-catchers are not in the habit of singing over their work. This is due to the same reason that a good deer-hunter does not talk and tell stories while following a trail.

The Yellow Warbler ranges from the Atlantic

YELLOW WARBLER.

to the Pacific, and over practically the whole of North America save the arctic barrens, Alaska, and our arid southwestern states. Mrs. Mabel Osgood Wright says "it is one of the particular victims which the cow blackbird selects to foster its random eggs, but the Warbler puts its intelligence effectively to work, and some-

[1] *Den-dro'i-ca aes'ti-va.* Length, 5 inches.

times builds a floor over the unwelcome egg." (*Birdcraft*, p. 95.)

The Yellow-Breasted Chat[1] is much larger than the typical wood warblers, being 7¼ inches long to their 5 or 5½ inches. It has an olive-green back and a sulphur-yellow breast and throat, with a white line extending from its beak above and around its eye. By these colors, and its

RED-EYED VIREO.

erect tail, it may easily be recognized. It is a very pert and saucy bird, and much given to frequenting the haunts of country dwellers.

The Chat is not a great singer. He has no regular song, and the notes he utters are jerky, erratic and elusive. Its voice has some peculiar quality which renders this bird very difficult to locate by sound alone. Many times I have been completely misled by its call notes coming from a thicket, and finally found the bird yards away from the spot whence its go-as-you-please voice seemed to come.

"A Chat courtship," says Mr. A. C. Webb, in "Some Birds, and their Ways," "is a sight never to be forgotten. In the spring, when birds begin housekeeping, the male Chat charms himself and his mate by some remarkable performances in the air. Launching himself from the top of some tall tree, he flutters from side to side, flirts his tail, stops, stands on his head, dangles his legs as if they were broken, turns somersaults, and makes a monkey of himself generally, as he descends to the thicket below, where his mate is perched among the briers. Sometimes he starts from the low bushes and rises almost straight up into the air until he is above the tree-tops. He chatters and screams as he goes, telling her to watch him now as he comes down, and see if in all her life she ever saw a bird that could do such wonderful feats. No doubt to her eyes he is the picture of grace and elegance as he performs on his flying trapeze, but to us his clown-like antics seem ridiculous."

The Chat of the East is represented in the far West by a long-tailed variety, and between the two their range covers nearly the whole of the United States, British Columbia and Mexico.

The American Redstart[2] looks like a small, pinkish-yellow understudy of the Baltimore oriole, 5½ inches long. Its colors and color-pattern are very similar to those of our old friend of the elm-trees, velvety black on the back and head, reddish-orange on the sides and breast, and white on the belly. The tail is orange and black, and the colors are very prettily disposed.

On the whole, this bird has (in my estimation) the most beautiful color-pattern to be found in all our long procession of warblers and ground-thrushes. The female is so different in color it is at first difficult to believe her of the same species. Her body-colors are brownish-olive above with sides of pale yellow, and the head is gray instead of black.

This beautiful bird is to be looked for all over North America from Labrador and Fort Simpson to northern South America. In the North it arrives in May, and abides until September.

The Water-Thrushes.—Beginners in bird-study are warned to note the fact that in the Warbler Family are several birds called "*Water-Thrushes*," which do *not* belong to the Thrush Family. It is a pity that they have not been distinguished by some other name. There are two species, the **Common Water-Thrush,**[3] and the **Louisiana Water-Thrush,**[4] the first a northern, the latter a southern bird. Both live in the dark recesses of virgin forests, where clear brooks gurgle over mossy stones, between fern-

[1] *Ic-te'ria vi'rens*. Length, 7.25 inches.

[2] *Se-toph'a-ga ru-ti-cil'la*. Length, 5.50 inches.

[3] *Se-i-u'rus no-ve-bo-ra-cen'sis*. Length, 6 inches.

[4] *S. mot-a-cil'la*.

covered banks. They are watchful and suspicious, but when flushed they do not immediately fly beyond gunshot, as nowadays every bird should do. The Louisiana Water-Thrush strongly resembles the wood-thrush, but is one-fourth smaller.

THE VIREO FAMILY.

Vireonidae.

It is quite difficult to point out peculiarities by which the vireos can be distinguished from the warblers. They are placed next to the shrikes because of a supposed resemblance to those birds in the shape of the upper mandible—hooked and notched. The vireos look so much like warblers that only an expert can distinguish them.

The Red-Eyed Vireo[1] is distinguishable at close range by its red eye with a white line over it, and the **White-Eyed Vireo**[2] also is marked by the white color of its eyes. Both are fairly good songsters, and the former is about as "domestic," in its habit of frequenting the haunts of man, as the yellow warbler. The former ranges from New York northwestward across the continent, the latter only as far as the Rocky Mountains.

THE SHRIKE FAMILY.

Lanidae.

The Great Northern Shrike, or **Butcher-Bird,**[3] is a bird of very striking personality. In appearance he is a high-headed, well-dressed dandy. In disposition, he is to-day a fierce little bird of prey, feeding solely upon flesh food; but to-morrow he will change into a modest insect-eater. It seems very odd to find a bird of prey among the Perching-Birds.

The Butcher-Bird is a bird of the North, breeding from Labrador to Alaska and visiting the United States only in winter, when it is almost impossible to obtain food at home. The species which we find in the United States in summer is the **Loggerhead Shrike,**[4] which closely resembles its northern relative, both in form and habits.

In the fields, you can easily recognize a Shrike by his bluish-gray back, and large head. His strong, hooked beak has a notch, or tooth, near the end of the upper mandible. He is deliberate and dignified in his movements, and like the true sportsman that he is, he is happiest when hunting. He catches and feeds upon small frogs, mice, small snakes and even birds (so it is said), and has the odd trick of hanging up, impaled upon a thorn, dead game which he cannot eat as soon as caught. Once I saw a Butcher-Bird seize a large field-mouse out of a freshly upturned furrow, and fly away with it, struggling vigorously. The mammal was so large and heavy it was surprising to see the bird bear it away. Many times I have seen dried frogs hanging upon thorns, where they had been placed when fresh, by Shrikes.

Every Shrike is a feathered Jekyll and Hyde. In summer and autumn, the harvest of insects is everything that could be expected. In Dr. Judd's Bulletin No. 9, Biological Survey, Department of Agriculture, the list of groups of insects destroyed by the Loggerhead Shrike fills a page, and includes such pests as caterpillars, cutworms, canker-worms, grasshoppers, crickets and weevils.

LOGGERHEAD SHRIKE.

But mark the winter and early spring record. Thirteen species of small birds are numbered among the Loggerhead's victims, of which five are sparrows, and others are the ground-dove, chimney-swift, Bell's vireo and snow-bunting. The Butcher-Bird is known to kill twenty-eight species of birds, some of them valuable insect-

[1] *Vir'e-o ol-i-va'ce-us.* Length, 6 inches.
[2] *V. no've-bo'ra-cen'sis.* Length, 5 inches.
[3] *La'ni-us bo-re-al'is.* Length, about 10 inches.
[4] *L. lu'do-vi'ci-an'us.*

destroyers, and none of them to be spared without loss except the English sparrow. On the other hand, this bird is a great destroyer of wild mice, which in cold weather formed one-fourth of its entire food. The Loggerhead also feeds freely upon lizards, snakes, frogs and fish, when they are obtainable. The Butcher-Bird is a deadly enemy of the English sparrow, and kills and eats them so industriously that in Boston certain city officials once felt called upon to order the Shrikes to be shot.

The accompanying table is a very full exposition of the food habits of the two members of the Shrike Family referred to.

THE WAXWING FAMILY.

Ampelidae.

The Bohemian Waxwing.[1]—Once, on a certain cold and bleak Thanksgiving spent on the banks of the Musselshell River in Montana, when the mercury stood at 8° below zero and the face of nature was a "gray and melancholy waste," a flock of birds settled in the top of a dead cedar that stood near our camp. They were like so many exquisite gems, found ready cut and polished in a desert of rocks; and the whole camp quickly turned out to admire the exquisite creatures at short range.

TABLE SHOWING PERCENTAGES OF PRINCIPAL ELEMENTS OF FOOD OF THE BUTCHER-BIRD AND LOGGERHEAD SHRIKE, CALCULATED BY VOLUME.

By SYLVESTER D. JUDD, United States Biological Survey, Bulletin No. 9.

NAME.	VERTEBRATES.	INVERTEBRATES.	MAMMALS.	BIRDS.	OTHER VERTEBRATES.	GRASSHOPPERS AND CRICKETS.	SPIDERS.	WASPS.	CATERPILLARS AND MOTHS.	GROUND BEETLES.	OTHER BEETLES.	MONTH.	NO. OF STOMACHS.
Butcher-Bird	77	23	22	55	..	8	3	1	6	4	1	.....	33
Loggerhead	76	24	55	14	7	13	1	..	2	4	6	Dec., Jan. and Feb.	14
Butcher-Bird	77	23	46	31	..	9	1	3	5	3	2	.....	17
Loggerhead.....	20	80	9	9	2	24	9	4	11	14	18	March and April.	16
Do.	11	89	3	..	8	71	3	..	4	7	4	May and June	17
Do.	2	98	..	..	2	67	2	4	1	5	19	July, Aug. and Sept.	22
Butcher-Bird	27	73	11	16	..	57	4	..	6	4	2	.....	17
Loggerhead	10	90	..	10	..	50	5	7	3	13	12	October and Nov.	19
Butcher-Bird ..	60	40	26	34	..	24	3	2	6	4	1	Average Oct. to April, inclusive	67
Loggerhead ...	28	72	16	8	4	39	4	3	4	9	13	Average for the whole year.....	88

The Great Northern Shrike is able to sing, but seldom does so; and many of his friends think he sings not at all. In summer it ranges all the way to Cook Inlet, Alaska, and in winter it migrates as far south as Virginia. In the southern states it meets the Loggerhead Shrike, and the two species so strongly resemble each other they are like two feathered Dromios.

I think that the Bohemian Waxwing, when alive and in perfect plumage, is one of the most exquisite perching-birds I know. It is not gorgeous or resplendent; but in dainty prettiness of form, immaculateness of plumage, and delicate refinement in color-scheme combined, it has few equals. The red wax-like tip on the

[1] *Am-pel'is gar-ru'lus.* Length, 8 inches.

BOHEMIAN WAXWING.

end of each secondary feather gleams like a ruby. No picture of this bird ever can fairly portray its beauties. The **Cedar Waxwing** or **Cedar Bird**[1] of the eastern United States is but a fair understudy of its more robust and also more beautiful brother of the Northwest and the far North. Any one can instantly identify one of these birds by its jaunty top-knot, and the little drops of vermilion wax on the tips of its secondaries, eight on each side.

THE SWALLOW FAMILY.

Hirundinidae.

The members of the Swallow Family are among the most sociable of our feathered friends, and also the most conspicuous.

The Purple Martin[2] loves the little house atop of a tall pole, which the country boy who loves birds takes pleasure in erecting for it. Forty years ago, thousands of the prairie farms of the Middle West bore these tall monuments to the love of wild birds which *is born in every right-minded boy!* And how gracefully the glossy-black Martins used to circle, and swoop, and gyrate about them. Sometimes the bluebirds took possession of the martin-boxes, and then George or John was troubled; for having designed and erected on high a dwelling especially for the Martins, it seemed morally wrong that they should be forestalled, or crowded out.

And then came Ahab, the English sparrow, a homely, quarrelsome, low-minded and utterly uninteresting little wretch, a gutter-rat among birds. Unless coerced with a shot-gun, he steals the nesting-boxes of all other small birds, driving before him the Martins, bluebirds, and many others who used to love our company. In the North the Purple Martin does not seem to thrive away from the haunts of man, and I believe their great decrease in number has been due almost wholly to the English sparrow. It is really a bird of the South, but there was a time when it was common in at least some of the northern states.

The Eave, or **Cliff Swallow**[1] is still more sociable than the purple martin, and also more enterprising. With complete confidence in man's

PURPLE MARTIN.

good-will toward the bird-world, it chooses a barn that is big and high, and prosperous-looking, and calls it home. From the edge of

[1] *A. ce-dro'rum.* Length, about 7 inches.
[2] *Prog'ne su'bis.* Average length, 8 inches.
[3] *Pet-ro-chel'i-don lu'ni-frons.* Length, 5¾ inches.

the nearest pond, it brings pellets of mud, and sticks a lot of them in a solid circle, against the outside wall of the barn, and close up under the eaves. Upon this, working most industriously to finish before previous layers have had time to dry, the cup-shaped nest is built out, pellet by pellet. At the last, the cup is narrowed down to a tube barely large enough to admit the bird, and the opening thrusts out into the air, usually tilted slightly upward.

All the members of a flock of Swallows build close together, nest joined to nest very frequently, and thus depends a most interesting Swallow town, usually called a "colony." Surely, any one who is not pleased and cheered by their sweet chattering and chirping under the eaves is "fit for treason, stratagems and spoils." Their flight is poetry expressed in motion. In catching the insects which constitute their food, they love to skim close to the surfaces of ponds and streams.

There are three Swallows which so much resemble each other it requires a reference to a good handbook of birds to identify them. These are the **Cliff, Bank** and **Tree Swallows.** The **Barn-Swallow** can be distinguished from these three by its very long and deeply forked tail, the tails of all the others being rather short.

CLIFF-SWALLOW AND NESTS.
Nests under eaves of log house, photographed by E. R. Warren.

THE TANAGER FAMILY.

Tanagridae.

The male **Scarlet Tanager**[1] is one of the most showy small birds of our American Passeres. Excepting its wings, which are jet black, its entire plumage is of a clear scarlet hue, as bright as the brightest ribbon. There is no precious stone which compares with it, for beside it the ruby is dull. The cardinal grosbeak is not nearly so bright as the male Tanager.

Wherever seen, the male Scarlet Tanager fixes the attention of the observer, and challenges admiration. It is an early spring arrival from the South, and in Washington, D. C., I have seen it in the parks while the trees were yet leafless. Some of those which came last year to the Zoological Park, New York, felt so secure

[1] *Pi-ran'ga e-ryth-ro-me'las.* Length, 6.50 inches

BARN-SWALLOW.
Hi-run'do e-ryth'ro-gas-tra.

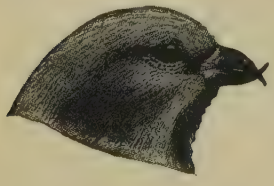
in our protection that they permitted their admirers to approach within ten feet of them.

The female of this species is widely different in color from the male, being dull olive-green above and greenish-yellow below.

THE FINCH AND SPARROW FAMILY.

Fringillidae.

This Family is a large one, and it embraces the perching-birds with strong beaks, such as the finches, sparrows, snow-birds and their near relatives, and one group of grosbeaks. By their beaks you shall know them,—short, and wide at the base, like the jaws of a pair of pliers. They are made for cracking all seeds which the owner does not wish to swallow entire.



The American Cross-bill[1] is a dull-red bird with brown wings and tail, and its bill is so emphatically crossed it seems like a deformity which must necessarily be fatal to a seed-eater. But Nature has her own odd ways; and it seems that the scissor arrangement of this bird's beak is to promote the husking of pine cones, and the cracking of the seeds.

This is a bird of the North, and in the East comes no farther south than a line drawn from Colorado to Washington, D. C. In the West it descends to Arizona, but everywhere in the United States it is only a winter visitor. With an opera-glass it is always easily recognized by its crossed bill.

The American Goldfinch[2] is a conspicuously yellow bird, though quite small. It is a plump-bodied, fluffy little bird, all sulphur yellow except a circular black cap atop of its head, and black trimmings on its wings and tail. It is exquisitely pretty, and, like a feathered coquette, loves to pose on the steep side of a tall mullen stalk, with no leaves about to cut off the admirers' view. It is sociable, also, and loves the garden, orchards and meadows of the self-elected "lord of creation," man.

As a weed-destroyer, this bird has few equals. It makes a specialty of the seeds of members of the Order Compositae, and is especially fond of thistles, ragweed, wild lettuce and wild sunflower. (Sylvester D. Judd.)

The Snow-Bunting[3] comes down from the far North, in the dead of winter, when the snow

SCARLET TANAGER.
Male and female.

falls fluffy and deep, and the song-birds of summer are basking in the sunshine of the South. They do not appear every winter, however.

[1] *Lox'i-a cur-vi-ros'tra minor.* Length, 6.50 inches.
[2] *As-trag-a-li'nus tris'tis.* Length, 5 inches.
[3] *Pas-ser-i'na ni-val'is.* Length, 6½ inches.

AMERICAN GOLDFINCH.

They come in flocks of from ten to twenty birds, and settle in the snow as if they love it. But for a few dark streaks on back and wings, they are the color of snow, and generally have the plump outlines which betoken good feeding and contentment.

When you see this bird, remember that it belongs to *the polar world*, quite as much as the arctic fox and musk-ox, and in summer it goes to the "farthest north" on our continent. Rarely indeed does it breed in even the most northerly portions of the United States, and seldom enters a southern state.

In winter the food of this pretty bird consists chiefly of the seeds of weeds that send tall fruit-stalks above the level of the snow. In our park grounds, we scatter wheat for it, on the tops of granite ledges from which the wind has blown the snow.

The Slate-Colored Junco,[1] often called the **Snow-Bird,** is also a bird of the snow-fields; but it is a home product rather than a visitor from the desolate Barren Grounds. When seen on snow, its slaty-blue back makes it appear like a dark-colored bird, but underneath it is dull white. Like the snow-bunting, it goes in small flocks, and in winter feeds chiefly upon weed-seeds and grain. It breeds in our northern states, and in winter migrates southward almost to the Gulf of Mexico. Altogether, thirteen species and varieties of Juncos are recognized in North America, and they are at home all the way from Alaska to Mexico and the Gulf.

The Sparrows.—There was a time when in America it was not only respectable but even honorable to be a Sparrow; but during the past ten years, the doings of one alien species, most unwisely introduced here have tended to bring the name into disrepute. How our native species must hate the interloper! But we protest that our native Sparrows are as sweet-voiced and interesting as ever they were; and as wholesale destroyers of noxious weeds, they are unsurpassed. After a careful investigation of the quantity of weed-seeds consumed in Iowa by the **Tree-Sparrow,**[2] Professor F. E. L. Beal calculated the total amount for one year to be 1,750,000 pounds, or about 875 tons! Practically without exception, all our Sparrows are diligent consumers of the seeds of noxious weeds.

SNOW-BUNTING.

If you doubt the vocal powers of Sparrows go

[1] *Jun'co hy-e-mal'is.* Length, 6 inches.
[2] *Spi-zel'la mon-ti-co'la.* Length, 6 inches.

with me to the country roads, and listen for three minutes to the delicious melody that pours from the quivering throat of a **Song-Sparrow.**[1] When he feels well, he will perch on the top of a hedge, secure a good grip on a comfortable twig, point his beak skyward at an angle of sixty degrees, and sing as if trying to burst his little throat. Mrs. Mabel Osgood Wright justly calls him "the darling among the song-birds," and "the most constant singer among our northern birds." In some localities, at least, they sing all summer long. In Iowa I have heard them a thousand times, bravely piping and trilling in the sweltering heat of July and August, when other birds were silent, and have been moved to wonder at the amount of energy stored up in their little bodies.

I think the best way to identify this bird is by its singing. Pick out the sparrow in gray and brown which sings to surpass all others, and it will be a Song-Sparrow. Its home is the eastern half of North America, from northern Manitoba to Mexico. West of the Rocky Mountains it becomes the *Mountain Song-Sparrow.* In the southwestern deserts it grows pale,—to match its environment,—and becomes the *Desert Song-Sparrow.* There are thirteen species of the Song-Sparrow genus,—or at least that number have been described, and Alaska is yet to be heard from.

The White-Throated Sparrow[2] is the species which comes next in general attractiveness. It is a very pert and pretty bird—for a sparrow, and its oddly marked head is easily identified. It wears a white goatee and a black cap, and on the latter is laid a broad arrow, in white. A white line comes down along the centre line of the head, and another comes forward over each eye, until the three come together at the base of the upper mandible. The song of this bird is pleasing, and nearly every self-respecting ornithologist translates it into English to suit his or her fancy; but, to tell the truth, the White-Throat never will win a prize as a great singer.

The English Sparrow.[3]—Let me dip my pen in blue vitriol; for my temperature rises at the thought of writing the name. Daily we see the unclean little wretches grubbing in the filth and microbes of the street, where no American bird will humble itself to feed. After twenty years of acquaintance, I am obliged to say that I never saw one catch a worm, a caterpillar, or an insect of any kind. When the elm-trees are loaded with tent caterpillars, an English Sparrow will let them crawl all over him, and not kill one. Instead of ranging out into the open fields and hunting for clean weed-seeds, this bird revels in the foulest dirt of the street. It does, however, manage to eat the seeds of the dandelion, when the heads are filling, in April and May.

WHITE-THROATED SPARROW.

The English Sparrow is not beautiful, either in form or plumage, and it cannot sing a note. Its tastes are low and vulgar. It is quarrelsome, and crowds out many other species of small perching-birds. In Cheyenne, Wyoming, when Mr. Frank Bond killed all the English Sparrows, and kept them killed, other perching-birds flocked into the city in great numbers, and many species bred there. The more persistently these

[1] *Mel-o-spi'za fas-ci-a'ta.* Length, 6½ inches.
[2] *Zo-no-tri'chi-a al-bi-col'lis.* Length, 6½ inches.
[3] *Pas'ser do-mes'ti-cus.* Length, about 6 inches.

interlopers are killed off, the better for all other birds. They can be made to serve well as subjects for dissection in the school-room, and for amateur taxidermists; and they make excellent food for captive hawks, owls, small carnivores, and live snakes of several species.

The introduction of this bird may well serve as a solemn warning against any further meddlings with Nature on that line. In the first place, there never existed the slightest reason

CARDINAL.

or need for this importation. Without serious consideration, or consultation with the persons most competent to advise, this bird was imported and planted in twelve widely separated localities in the United States. To-day it is a feathered nuisance that spreads over one-half the United States, and excepting locally cannot be abated. Nevertheless, it is within the power of western towns and cities wherein it has not yet gained a foothold to follow the example of Mr. Bond in Cheyenne, and destroy every colony that enters before it has time to breed.

The Cardinal, or **Cardinal Grosbeak,**[1] also called the **Cardinal Redbird,** is the pride of the South. From New Orleans to New York it is persistently trapped and "limed,"—not to "keep" as a cage-bird, but to *sell* as such. Poor, unhappy Cardinal! How much better its fate had it been created black instead of bright cardinal red, with no jaunty top-knot, and no fatal gift of song!

In a cage 6 by 9 feet, or even 4 by 4, a bird like this flies to and fro, and in company with a dozen other small birds finds life far from dull. But if you put a wild song-bird in a cage barely large enough for a canary, the bird is wretched, it dies soon, and the keeping of it is a sin against Nature. Excepting canaries and a very few other species, if you cannot keep birds (and mammals, also) in big cages, *do not keep them at all!* The way thousands of song-birds are caught in some portions of the South, to sell as cage-birds, is a sin and a shame. At this date, New Orleans in particular has before her an imperative duty in breaking up this business. Children everywhere should be taught that it is *almost impossible for any one save an expert bird-man to take young song-birds, and rear them successfully.* Young insectivorous birds require specially compounded bird-food, and it must be given to them *every hour,* with small forceps—a very tedious operation.

In the kindness of their little hearts, children often take young song-birds from the nest, cage them, and try to feed them on what some little folks like best—cake and cream! They might as well give them poison! For any one ignorant of the precise methods necessary in rearing insectivorous birds, to take such birds from their parents is *cruelty and destruction!*

The sight of a wild Cardinal always compels attention. The bird is not only beautiful in color, but it is aristocratic in form and manner. It comes up from the South into New York state, and the Ohio River region, and extends westward to the edge of the plains region.

The Rose-Breasted Grosbeak[2] is, in all respects save one, a very beautiful bird. It has a big, clumsy-looking, conspicuously white beak, which almost spoils the whole bird. But the pink-sunset flush on the clear sky of its breast, its glossy-black head and tail, and black-and-white wings, are so beautiful a combination they lead one to forgive the homely beak. The delicate pink-rose tint on the breast renders the identification of this bird very easy, even at first sight.

I must confess that I remember nothing of

[1] *Car-di-nal'is car-di-nal'is.* Length, 8.50 inches.

[2] *Zam-e-lo'di-a lu-do-vi-ci-an'a.* Length, 8 inches.

the Grosbeak's song, and that it made no impression on me, even when these birds were around me. Certainly it is no great singer, not more than third-rate, at the best, or its song would be more in evidence. It is celebrated as an enemy of the potato-bug, and it feeds omnivorously upon other insects, buds, blossoms, seeds and fruit.

ROSE-BREASTED GROSBEAK.

The range of this species is bounded by the great Rocky Mountain barrier. Westward thereof is found the *Black-Headed Grosbeak*, and the arid lands of Texas, Arizona and southern California are inhabited by the *Western Blue Grosbeak*.

The bluest bird that flies in North America is the **Indigo Bunting,**[1] a trim little craft, built and rigged like a warbler, and of warbler size. Like the ocean, it is

"Deeply, darkly, beautifully blue,"

—not the sky-blue of the jay, but like indigo. In the East you cannot possibly mistake it. The deep-blue bird of the Far West is the *Lazuli Bunting*, our bird's nearest relative.

[1] *Cy-a'no-spi-za cy-a'ne-a.* Length, 5.50 inches.

THE BLACKBIRD FAMILY.

Icteridae.

This Family includes several showy species of birds which are very much in evidence, and quite generally known to country dwellers. Five representative and very interesting species will be noticed.

The Bobolink[2] is a bird with two very distinct characters. It has a name and a suit of feathers for the North, another suit and another name in the South; and it has three reputations.

When in springtime a certain jolly and vigorous little song-bird comes up from the South, he puts on a dress-suit of marvellous design, in black, white, brown and gray, as shown on page 178. He is then a regular swell, and his name is Bobolink. His mate, however, is a plain little bird, clad in yellowish-brown, with slight trimmings of yellow and white. They frequent the marshes and low meadows, nest on the ground, and rear from five to seven young.

That accomplished, the male bird doffs his pretty spring suit, acquires plumage like that of the female, and then they go South. There they become **Rice-Birds,** and they raid the rice-fields of the southern states until they grow quite fat. Next, enters the Man-With-a-Gun; and the birds fall easy victims. The birds are shot for two reasons: The rice-planters find them a nuisance in their fields, and many people think Rice-Birds are good eating.

Consider the **"Reed-Bird** on toast," or, worse still, "on a skewer." It is a trifle too large for one mouthful, but by no means large enough for two. A healthy, able-bodied American at work upon this two-ounce bird with a ten-inch knife is a sad but impressive spectacle. It is to be hoped that it will be long ere the people of this country really have cause to turn to this tiny song-bird—*or any other song-bird*—as a source of food with which to satisfy hunger. How can any self-respecting man deliberately order so pusillanimous a dish as "Reed-Birds on a skewer?" There is a land so populous and poor that its people eat sparrows because they need them for food; but it is far from America.

The Bobolink is really a very acceptable singer,

[2] *Dol-i-cho'nyx o-ry-ziv'o-rus.* Length, 6.75 inches.

RED-WINGED BLACKBIRD.

and has furnished a theme for several poets, of whom Bryant was the most celebrated.

The Red-Winged Blackbird [1] is a bird that delights my soul. No marsh or cat-tail swamp is complete without him. No spring ever can be perfect without his sweet, liquid gurgle—"O-ka-leé." You hear that flute-like call when the sky is clear, the warm sunshine is flooding field and stream, and you are glad that you are alive.

The jet-black plumage of this bird, with epaulettes of scarlet and white, make a brave show among the dull green blades of the cat-tails. As a rule, bird-songs translated into English do not appeal to me very strongly; but the Red-Wing does say "O-ka-leé" to perfection!

The typical Red-Wing is an eastern bird, but its half-dozen subspecies are so well dispersed throughout the United States that almost every region possesses one.

The Yellow-Headed Blackbird [2] is a very conspicuous species throughout the West, from Indiana almost to the Pacific. Its entire head, neck and breast are of a dull-yellow color, but elsewhere it is wholly black, save a white patch on the wing. In Montana it is very common in summer.

The Meadow-Lark [3] is one of the most trustful and sociable of our birds. As its name implies, it is partial to open grass-lands, and its favorite hunting-grounds are the bits of waste land in sloughs (called "*slews*" in the West), that are full of low weeds. This bird does not like tall grass or weeds, for it is very curious to know all that is going on in the world about it. It is an indifferent flyer,—slow and short,—and manifests a decided preference for the haunts of man.

The Lark contributes much to the pleasures of life on a farm. Its bright-yellow breast and throat, with a jet-black neck-scarf, are as cheerful as an April sunburst. The long, conical beak, rather long legs and erect carriage of this bird give him an air of cheerful confidence which says to you, "I'm a good fellow, and you're another!" His song is nothing to boast of, but he always pipes up cheerfully, and does the best he can. I always liked this bird, and count him as one of the dear friends of my boyhood. To me, his plumage is beautiful, especially when seen on a fresh, dewy morning, when the sun is newly risen, and the song-birds are greeting the new day.

According to the investigations of the Biological Survey, the Meadow-Lark is one of the most valuable of all birds that frequent farming re-

MEADOW-LARK.

[1] *Ag-e-lai'us phoe-ni'ci-us.* Length, 9 inches.

[2] With an apology to the reader, it is stated that the Latin name of this bird is *Xan-tho-ceph'a-lus xan-tho-ceph'a-lus:* and its length is about 9 inches.

[3] *Stur-nel'la mag'na.* Length, about 10 inches.

gions. Throughout the year, insects make up 73 per cent of its food, grain, 5 per cent, and weed-seeds, 12 per cent. During the insect season, insects constitute over 90 per cent of this bird's food supply. As a destroyer of insects and weeds, this bird is entitled to the most perfect protection that laws and public sentiment combined can afford.

In Montana, the **Western Meadow-Lark** [1] quite wearied me by the tiresome iteration, day after day, of its one short, seven-word song. This was it:

As our "outfit" pulled over the smoothly shaven Missouri-Yellowstone divide, in the month of May, I think we heard that song repeated a thousand times, or less; and when the wind blew hard for five long days without intermission, even that cheerful welcome at last became irritating.

The eastern Meadow-Lark inhabits the eastern half of the United States, and the western species begins at the western edge of Iowa and Missouri; *but neither of them belongs to the Lark Family!*

The Baltimore Oriole,[2] or **Hang-Nest,** has beautiful plumage of orange and black, a very pleasing song, good habits, and therefore is one of our feathered favorites. Either when perching or on the wing, it is a very graceful bird. It is the most skilful builder in North America, and constructs a strong and durable hanging nest which is a marvel of intelligent and skilful effort. The Oriole does not believe in having boys make collections of Oriole eggs. The outermost branches of a very tall and very drooping elm are particularly suited to its views of an ideal building site.

The nest of this Oriole is bound to create in the mind of any one who examines it attentively a high degree of admiration for the mental capacity of its builder. Its superstructure is composed very largely of long, spring-like horse-hairs, so tightly woven together that even when the end of a hair waves freely in the air, it is impossible to pull it out. Here is genuine *weaving*, done with hair and fibrous fragments of soft, weathered bark. Let it be remembered at this point that not even the higher apes know how to *weave* a nest or a roof.

The mouth of the Oriole's bag-like nest is thin but strong, and terminates in an edge as thin and firm as hair-cloth. A nest now before me is

BALTIMORE ORIOLE AND NEST.

five inches long, four inches in outside diameter at a point half-way between bottom and top, and its opening is two inches in diameter. For a space of two inches, the horse-hairs of the upper margin are wrapped around an elm-twig the size of a slate-pencil. *At no point* are the walls more than a quarter of an inch in thickness, and the inside is as symmetrical and shapely as if the nest had been woven around a form.

The usefulness of the Baltimore Oriole is fully equal to its beauty. As a destroyer of cater-

[1] *Sturnella neglecta.* Average length, about 9 50 inches.

[2] *Ic'te-rus gal-bu'la.* Length, 8 inches.

pillars it has few equals among birds. In May, insects constitute 92 per cent of its food, and in April and July 70 per cent. For the entire year, animal food, chiefly caterpillars and beetles, constitute 83.4 per cent of its food, and vegetable matter the remainder of 16.6 per cent.

The Purple Grackle, or **Crow Blackbird,**[1] has prompted scores of persons to ask, "What is the name of that very shiny, jet-black bird with a long tail?" No wonder it attracts attention, especially in contrast with the lustreless rusty blackbird. Its color is deep purple-black, and it is as shiny as if it had been varnished all over. It loves to follow the plough, and pick up the big, fat grubs that are exposed to view, before they have had time to burrow out of sight. Often in their eagerness not to miss a chance, these birds will approach within ten feet of the plough-handles. It is then that one notices that their eyes are light yellow, and very odd-looking. This bird has no song, and its sign of contentment with life is like a great asthmatic wheeze. The tail of this bird is creased lengthwise along the middle, or "keeled."

PURPLE GRACKLE.

Prior to the systematic investigations of the Department of Agriculture the value or harmfulness of the Crow Blackbird was in dispute. The examination of 2,346 stomachs revealed that during an entire year the food supply of this bird is made up in the following percentages: insect food, 26.9; other animal food, 3.4; corn, 37.2; oats, 2.9; wheat, 4.8; other grain, 1.6; domestic fruit, 2.9; wild fruit, 2.1; weed-seed, 4.2; mast, 14; total, 100. "The charge that the blackbird is a habitual robber of birds' nests is disproved by the stomach examinations." (F. E. L. Beal.)

[1] *Quis'ca-lus quis'cu-la.* Length, about 12 inches.

THE CROW FAMILY.

Corvidae.

Take them all in all, there is no Family in the whole Order of Perching-Birds whose members have more striking individual traits, or more commanding personality than the Family which contains the ravens, crows, jays and magpies. All these birds are bold and conspicuous, and fond of entering into the affairs of man. The crow feels it to be his duty to assist in planting-operations. The blue-jay robs you, and scolds while he does it. The magpie will hold a fifteen-minute conversation with you, and tell you of all his troubles. Go where you will in the United States, some of the twenty species of birds of this Family will cheerfully bear you company.

The American Magpie,[2] of the somewhat "wild West," is a beautiful and showy bird, and in winter especially it bravely strives to adorn the bare and bleak valleys, foothills, divides and mountain-sides of the Rocky Mountain region. In the whole of the West, I know of no bird more beautiful in flight than this. Its plumage is half glossy-purple black, and half snow-white; and this, with its extremely long tail streaming after it in its flight, makes it a very striking object. In winter the absence of other birds renders the Magpie trebly conspicuous and welcome. Its flight is slow, dignified, and as straight as an arrow.

The Magpie is fatally fond of fresh meat, and many a fine bird meets its death by devouring poisoned meat laid out for wolves. If hospitably received, this bird will come close to the haunts and camps of man, investigating everything, and looking for scraps of food. If not fired at, it soon becomes very friendly, and a small cabin easily becomes the haunt of a score of birds. Some of those in the Flying Cage of the New York Zoological Park are at times as amusing as monkeys. They come close up to the wires, and when the visitor bends down, to listen or converse, they actually *talk*—in their language. In low, confidential tones they tell

[2] *Pi'ca pi'ca hud-son'i-ca.* Length, about 18 inches.

of their fear of the big condor, the painful pecks they get from the herons, and the greediness of the ducks in devouring all of their kind of food.

In the days of elk and buffalo slaughter, the Magpies feasted continually upon fresh meat. Now they make friends with the ranchmen, and eat all kinds of food. This interesting bird ranges from Alaska, and the edge of the arctic barrens, southward through the great plains and mountains to the arid regions of the South-

Beside his harsh "Jay," a crow is a sweet songster. He will take your cherries right before your eyes, and then scold you roundly for not looking pleasant about it! He robs the nests of other birds, eating eggs or young, whichever may be there; and to that extent he is a pest. During the closed season on eggs and young nestlings, he lives on insects—until berries and small fruits ripen. If Jays were as numerous as English sparrows, it would be necessary to

AMERICAN MAGPIE.

west. It is easily kept in confinement, if provided with a large cage and a suitable house, *out-of-doors*.

The Blue-Jay[1] needs no description—only toleration; for his reputation would be all the better for washing. He is a bird of unbounded assurance, and being well known as a marauder, it is only his audacity which saves him from extermination. Externally, he is really a beautiful bird, but his voice is strident and unmusical.

reduce their number; but they are not so numerous or so destructive that we need to attack them.

Steller's Jay[2] is one of the handsomest birds of the moist and dark forest region of the Pacific coast, which extends from Mount St. Elias to San Francisco Bay. It is also the type of three subspecies, or varieties, found farther east and south. It is the Pacific coast counterpart of our blue-jay,—high-crested, barred with black

[1] *Cy-an-o-cit'ta cris-ta'ta.* Length, 11.50 inches.

[2] *Cy-an-o-cit'ta stel'ler-i.* Length, 12.50 inches.

on wings and tail, and with blue as its prevailing color.

The Piñon Jay[1] (pronounced pin'yone) is a bird well worth knowing. On the Sierra Nevada mountains and adjacent plateaus, where the piñon pine, juniper and cedar bravely struggle against the scarcity of water, and only half clothe the rugged nakedness of Nature, this Jay is a welcome habitant. I think it safe to say that you will find it wherever you find the piñon

BLUE-JAY.

pine, whose big, husky cones furnish a generous quantity of seeds, called "nuts," which are good for man, and grand food for all the wild creatures that can crack their delicate shell.

I have never seen the Piñon Jay so numerous that it could be called a "common" bird throughout an extensive region. At the same time, it is a bird of social habit, and given to flocking, quite like our eastern crow. It is really a connecting link between the crows and jays. It has a short, square tail, no crest or "top-knot;" its predominating color is grayish-blue, and its cry is a crow-like "*caw.*"

Clarke's Nut-Cracker[2] is a bird of the western mountain-tops and canyons, and a companion of the mountain-sheep. Wild creatures that love to dwell on high mountains, amid grand scenery, appeal to my affections more strongly than some others. To me, this bird recalls pictures of mountain-parks, "rim-rock," "slide-rock," pines and cedars bravely climbing up steep acclivities, gloomy canyons, and rushing streams of icy-cold water below all.

I first made acquaintance with this bird while hunting elk and mountain-sheep, on a fearfully steep mountain-side, with a magnificent panorama spread out below. It greeted me in friendly fashion with the rasping "Kurr, Kurr!" which, when heard amid such surroundings, is not soon forgotten. It has been my misfortune, however, never to see the remarkable habit thus graphically described by Mrs. Florence Merriam Bailey in her delightful "Handbook":

"Living mainly on the crests of the ranges, the birds fly to the high peaks to get the first rays of the sun, and when warmed go for food and water to the lower slopes. Their method of getting down is startling at first sight. Launching out from a peak, with bill pointed downward and wings closed, they drop like a bullet for a thousand feet, to the brook where they wish to drink. Sometimes they make the descent at one long swoop, at other times in a series of pitches, each time checking their fall by opening their wings, and letting themselves curve upward before the next straight drop. They fall with such a high rate of speed that when they open their wings there is an explosive burst which echoes from the canyon walls."

The head, neck and body of this bird are uniform ashy gray, and the wings and tail are black, with a white patch half-way down the former. The Nut-Cracker is really a small crow, twelve inches long, and much resembles the common gray and black crow of Europe. It is found in all the mountains of the West, from Alaska to Mexico, and straggles eastward to the eastern edge of the Great Plains. It is often called **Clarke's Crow.**

The Canada Jay, Whiskey-Jack, or **Moose-Bird,**[3] is by reason of its personal oddities and assertiveness perhaps the most conspicuous and widely known of all the perching-birds of the great coniferous forests of Canada. Every man who has trailed moose or caribou, or for any reason has camped in the Laurentian wilderness, knows well this audacious camp-follower, and remembers him with interest, if not even friendship. He has no real song, and his cries are

[1] *Cy-an-o-ceph'a-lus cy-an-o-ceph'a-lus.* Length, 11 inches.

[2] *Nu-ci-fra'ga co-lum-bi-an'a.* Length, 12 inches.

[3] *Per-i-so're-us canadensis.* Length, 12 inches.

rather harsh and strident ; but in his native solitudes, where bird-sounds are so seldom heard, the voyageur is always glad to hear his call. And surely, every perching-bird that chooses to brave the rigors of the northern winter instead of migrating is entitled both to respect and admiration.

The plumage of the Canada Jay has a peculiar fluffy appearance, suggestive of fur. Its prevailing color is ashy-gray. The nape and back of the head are black, but the forehead is marked by a large white spot. The wings and tail are of a darker gray than the body. The home of this interesting bird—the companion of the moose, as well as of forest-haunting man—extends from Nova Scotia, and northern New England, throughout Canada to Manitoba, and northward to the limit of the great forests.

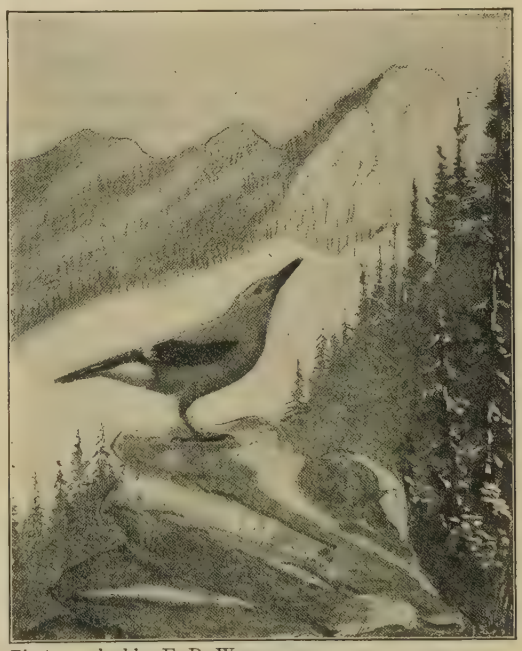
The Common Crow[1] needs no description. When finer birds were abundant, we cared little for him; but now that bird-life generally has so greatly diminished, we feel like welcoming him as a friend. His cheerful *"Caw"* is a welcome sound, and his services to the farmer overbalance the bad things he perpetrates. The Department of Agriculture, through Professor F. E. L. Beal, has officially investigated him, published the court records of his case, and pronounced him a bird worthy of protection. It is declared, after an examination of the stomachs of specimens, that the noxious insects destroyed by the Crows—cut-worms, caterpillars, grasshoppers, and also mice—represent a saving of more grain than the bird consumes.

It must be admitted, however, that the Crow does many things he should not. He is too fond of eggs, and also of young birds. He will pull up, by the roots, altogether too much newly planted corn ; which is very unfair toward the farmer. While the damage is seldom serious, it is always annoying; but when the Crow passes the limit of human endurance, powder and lead are his portion. For example: when a Crow nesting in Beaver Valley elected to make visits to our duck-pond where young wild-ducks were hatching, and take three mallard ducklings in one morning, Curator Beebe was compelled to choose quickly between ducks and Crows, and provide for the survival of the fittest.

[1] *Cor'vus a-mer-i-can'us.* Length, 18 to 20 inches.

The American Raven[2] is a bird of the "wild West," quite rare, and seldom seen beyond the mountains. Even when you see it for the first time, you will readily recognize it by its all-black plumage, large size, slow and heavy flight, and its hoarse and seldom *"Quock!"* The crow is at all times a cheerful citizen, but the Raven always has a sore throat, and is always going to a funeral.

He lives with Clarke's nut-cracker and the other dwellers on the mountain-tops north of the arid regions of Arizona and New Mexico, and nests in the crevices of high, rugged cliffs or canyon walls that are as completely inaccessible as can be found. He is suspicious of all attentions, wants no companions save of his own kind, and



Photographed by E. R. Warren.

CLARKE'S NUT-CRACKER.

mighty few of those. The *"Quock"* of a Raven in a rock-ribbed and gloomy canyon is anything but a cheerful sound.

Like the vulture, this bird feeds upon dead animals, dead fish, and sometimes also upon the poisoned meat that wolfers distribute so generously.

[2] *Cor'vus co'rax sin-u-a'tus.* Length, 22 to 24 inches.

THE HORNED LARK FAMILY.

Alaudidae.

There is a Lark Family which we regret to say does not include the *meadow-lark;* for this separation of birds bearing the same general name tends to create confusion. In Europe the Lark Family is a very large one, and contains about a hundred species, the most celebrated of which is the unfortunate skylark. It is unfortunate because of the wholesale and heartless manner in which it is caught and kept in pitiful captivity as a "cage-bird." In London these wretched little creatures are sold by the thousand, sometimes at sixpence each, or even less.

Strange to say, in America the Lark Family is represented by only twelve species and subspecies, of which the **Horned Lark** or **Shore Lark**[1] is the best type. It is called "Horned" Lark because of a small, pointed tuft or brush of feathers which lies along the side of the head above the eye, pointing backward and thrusting its tip through the regular outline of the back of the head. The resemblance of these points to horns is quite far-fetched, but it seems to have been brought in to stay.

This bird looks very much like a small plover. Our eastern species is by habit a shore-bird, whence its second name. It comes to us in winter, in flocks of from six to twenty individuals, and at that season its plumage is not so bright and pleasing as in spring.

The West and Southwest are inhabited by nine subspecies of Horned Larks, ranging all the way from Mexico to British Columbia, some of them necessarily living in hot countries, and far from large bodies of water.

THE FLYCATCHER FAMILY.

Tyrannidae.

There are many little birds, in size next above the sparrows, which look as if they ought to sing; but in reality they do not. They are very expert at catching insects, however, and nothing that flies can escape them in mid-air. These birds make up the Family of Flycatchers, and to the farmers of this country every flycatcher is worth double its weight in pure silver. Altogether there are about thirty species.

The Kingbird,[2] also called the **Bee "Martin"** and **Bee-Bird,** may well stand as the representative of this Family. Whenever you see a small bird swiftly and actively chasing a large crow in mid-air, darting down upon the back of the black fellow every hundred feet or so, with a peck that sends a thrill of life along his keel, you may know that the gallant little warrior is a Kingbird, and it is driving the crow away from the vicinity of its nest. The performance is like that of a man and a mad hornet. The crow thinks not of battle, but only of getting on in the world, and giving the nestlings of his tormentor a good square mile of crowless space in which to grow.

Look long enough, and you will see the Kingbird return from the chase, perch on his favorite dead limb at the edge of the field, smooth his feathers and renew his watch for flying insects. Presently you will see him dart from his perch, swoop to a certain point in space, and then return to his place. He has caught some flying insect, and like Oliver, "wants some more."

Never shoot a Kingbird. It is easier to "identify the species" on the wing than lying dead, all shot to pieces. Without killing this most courageous of all birds—which can whip almost anything that wears feathers, but attacks only crows and hawks—you can see that its colors are bluish-gray, trimmed with black and white.

The *Crested Flycatcher,* the dear little *Phœbe-Bird,* and the *Wood-Pewee* belong to the Flycatcher Family.

[1] *O-toc'o-ris al-pes'tris.* Length, 7.50 inches.

[2] *Ty-ran'nus ty-ran'nus.* Length, 8 inches.

CHAPTER XVII

THE ORDER OF ODD FAMILIES

MACROCHIRES

With certain exceptions, the different Orders of American birds are founded on reasonable grounds and built up of homogeneous materials. As a rule, a few moments' examination of a bird enables one to name the Order to which it belongs. There is no difficulty about the birds of prey, swimmers, fishers, waders or woodpeckers.

Unfortunately, however, Nature has turned out of her workshop so many odd forms that it has been found necessary to have a certain number of Orders for them. In mammals we have seen that the Order *Ungulata* is of this character. In birds, there are two such Orders. One is that which contains the cuckoos, road-runners and kingfishers, and the other is that which forms the subject of this chapter.

The Order Macrochires means literally "odd ones," and its members do not belie the name. On the strength of certain resemblances in anatomical structure, observable only after the birds are dead and dissected, our humming-birds, swifts and goatsuckers (*i.e.*, birds like the whippoorwill and nighthawk) are grouped together in this Order, in three Families, as follows:

	FAMILIES.		EXAMPLES.
ORDER MACROCHIRES.	GOATSUCKERS, .	*CAP-RI-MUL'GI-DAE*, .	Nighthawk, Whippoorwill.
	SWIFTS, . . .	*MI-CRO-POD'I-DAE*, . .	Chimney-Swift.
	HUMMING-BIRDS,	*TRO-CHIL'I-DAE*, . . .	Ruby-Throated Humming-Bird.

THE GOATSUCKER FAMILY.

Caprimulgidae.

The Nighthawk[1] is far from being a true hawk. It belongs to a Family of birds which have soft, owl-like plumage, and enormous mouths, fringed above with a row of stiff bristles, for use in capturing insects on the wing. Many years ago, when people believed many things that were not true, some believed that these big-mouthed birds sucked goats; hence the absurd name applied to the Family.

Whenever, during the hour just before sunset, you see a good-sized bird with dark plumage, long, sharp-pointed wings, and a big white spot on the under surface of each wing,—wheeling, soaring, dropping and circling through the air,—you may know that it is a Nighthawk, catching insects. Its flight is graceful and free, and when on the aerial war-path it is a very industrious bird. Some people compare this bird on the wing with bats; but I see no resemblance save the bare fact of semi-nocturnal flight.

THE NIGHTHAWK.

[1] *Chor-dei'les virginianus.* Length, about 9.50 inches.

When this bird alights upon a tree to rest, it chooses a large and nearly horizontal limb, on which it usually sits lengthwise. As it sits motionless on a large limb, the bird strongly resembles a knot. This is a trans-continental bird, being found from the Atlantic to the Pacific, in wooded regions, and northward to the Mackenzie River.

The Whippoorwill[1] needs no introduction. It is more than a bird. It is a national favorite.

When the mantle of night has fallen, and the busy world is still, we who are in the country in summer often hear a loud, clear, melodious whistle from somewhere near the barn. As plainly as print, it exclaims, "*Whip*-Poor-*Will'!*" and repeats it, again and again. Before each regular call, there is a faint "*chuck*," or catching of the breath, strong emphasis on the "whip," and at the end a piercing whistle which is positively thrilling.

Sometimes the bird will come and perch within thirty feet of your tent-door, and whistle at the rate of forty whippoorwills to the minute. Its call awakens sentimental reflections, and upon most persons exercises a peculiar, soothing influence. It has been celebrated in several beautiful poems and songs.

The range of this interesting bird is the same as that of the nighthawk. In the South, both are replaced by another goatsucker called, from its whistle, the **Chuck-Will's-Widow.** Until actually hearing it, one can scarcely believe that any bird of this Order can say things as plainly as this bird says "Chuck Will's Wid-ow!" The Pacific states, from British Columbia to Mexico, and eastward to Nebraska, have the **Poor-Will.**

THE SWIFT FAMILY.

Micropodidae.

The Chimney-Swift, or **Chimney-"Swallow,"**[2] has been for a century or more classified with the swallows and martins, but recent studies of its anatomy have caused its removal from their group. This is the bird whose nest and young sometimes tumble down into your fireplace in spring or summer, and cause commotion.

To me, the nesting habits of this bird seem like faulty instinct. A chimney is a poor place of residence for a bird, and the habitants frequently come to grief. If the aperture is small, the householder objects to having the chimney stopped by nests; and if it is large, so many Swifts may nest there that their noise is an annoyance. These birds get up and out before daylight, to hunt insects that fly at night, and doubtless many a "ghost" in a "haunted-house" is nothing more frightful than a colony of these birds in the chimney.

This bird has the ability to fly straight up, or straight down, else it could not enter or leave a chimney. It is quite an aerial gymnast, and feeds only when on the wing. Its flight is very graceful, and both in manner of flight and personal appearance it so closely resembles a short-tailed swallow that there are few persons who can distinguish the difference in the flying birds.

One strongly marked peculiarity of this bird is that the tip of each tail-feather ends in a sharp, wire-like point, caused by the shaft of the feather being projected considerably beyond the vane. The eastern Chimney-Swift ranges westward to the Great Plains. On the Pacific slope is found another species, a close parallel to the preceding, called the *Vaux Swift.* The *White-Throated Swift* of the Pacific States is distinguished by its white throat and breast, and a few white patches elsewhere.

THE HUMMING-BIRD FAMILY.

Trochilidae.

The Ruby-Throated Humming-Bird[3] represents the Family which contains the smallest of all birds. When the trumpet-vine on your veranda is in flower, you will see this delicate creature dart into view, like a large-winged insect, and poise itself easily and gracefully in mid-air at the mouth of the most conspicuous flower. Its tiny wings beat the air with such extreme rapidity and machine-like regularity that you see only a gray, fan-shaped blur on each side of the living bird. It holds itself in position with the greatest exactitude, thrusts its long and delicate beak into the heart of the flower, and, with the skill of a surgeon probing a wound, extracts the tiny insects or the honey so dear to its palate.

[1] *An-tros'to-mus vo-cif'er-us.* Length, about 9.50 inches.

[2] *Chae-tu'ra pe-lag'i-ca.* Length, 5 inches.

[3] *Troch'i-lus col'u-bris.* Length, 3.25 inches.

As the bird poises in mid-air, the sunlight catches the patch of brilliant ruby-red feathers on its throat, and sets it aflame. To make up for their diminutive size, and give them a fair share of beauty, Nature has clothed the throats and

RUBY-THROATED HUMMING-BIRD.

breasts of many Humming-Birds with feather-patches of the most brilliantly iridescent colors,—ruby-red, scarlet, green, blue and gold,—which flash like jewels. Others again have long, ornamental tail-feathers, ruffs, and other showy decorations in feathers.

The Humming-Birds are so very diminutive one never ceases to wonder how such frail and delicate creatures, feeding only upon the smallest insects and the nectar of flowers, can make long journeys over this rough and dangerous earth, withstand storms, build their wonderful little nests, rear their young, and migrate southward again without being destroyed. Of course their diminutive size enables them to escape the attention of most of the living enemies which gladly would destroy them.

The nest of a Humming-Bird is about as large in diameter as a lady's watch, and the eggs, of which there are two, are the size of adult peas. The food of these birds generally consists of minute insects, many of which they find in large flowers. When at rest, perching, the average Hummer is not beautiful in form. Its head seems too large, its neck and body much too short, and its wings too long. It seems top-heavy, and as if destitute of legs. It is on the wing that these creatures look their best.

What Humming-Birds lack in size, they try to make up in number. There are nearly five hundred species, and they are found only in the New World. They are thoroughly tropical, but in warm weather, and the season of flowers, they migrate as far north as Alaska, and as far south as Patagonia. Our country makes an acceptable summer home for about sixteen species.

The Ruby-Throat is the only one inhabiting the eastern half of the United States, all the others being found west of Arkansas, and the Rocky Mountains.

CHAPTER XVIII

THE ORDER OF WOODPECKERS

PICI

The Woodpeckers are the natural protectors of the forests of the temperate zone. But for them, tree-borers would multiply without limit, and the number of trees that would fall before the insect pests is quite beyond computation. While the robin, the thrush and the warblers take care of the caterpillars and the leaf-insects generally, the woodpecker sticks to the business of his own guild, and looks after the pests that attack the bark and the wood. The tree-creepers assist by picking off insects from the outside, but when it comes to the heavy work of digging borers out of the bark by main strength, the woodpecker is the only bird equal to it.

There are about twenty-five species of woodpeckers in the United States.

Usually, the long, barbed tongue of this bird is sufficient to spear a borer, and drag it forth to meet the death it deserves. When this will not do the work, the woodpecker's claws take a good grip on the bark, and serious work begins.

Do not think, however, that because a rolling tattoo beaten on a hard dead limb can be heard a quarter of a mile, that the bird making the noise is working unusually hard. Quite the contrary. The loud tattoo is a signal, like the "certain whistle" of a small boy. In our Beaver Pond, the golden-winged woodpeckers sometimes beat on the galvanized-iron drums which protect the bases of the trees from the teeth of the beavers.

When a woodpecker is working hardest, you hear only a faint "chuck! chuck! chuck!" as he drives his sharp, wedge-like beak into the bark, or soft wood. Often the falling chips are your first notice that a winged forester is at work aloft, digging out and devouring the larvae that, if left alone, bring decay and death to trees.

You may be sure that whenever you find one of these valuable birds at work, there is need for him. To-day, a great many persons know their value, and protect them. Occasionally, however, men who are so thoughtless or so mean as to engage in the brutal pastime known as a "side hunt," do lower themselves, and injure the landowners about them, by killing every woodpecker that can be found,—for "points." If all farmers only knew what a loss every "side hunt" means to them, such wicked pastimes would not be tolerated.

Although the woodpeckers are not counted as birds of song, to me the loud, joyous cry of the flicker, the downy and the red-head, ringing through the leafy forest aisles, is genuine music. One species cries "*Cheer*-up! *Cheer*-up!" and it cheers-up and thrills me to hear it. Even in summer, when other birds are plentiful, it is a welcome sound. In bleak winter, when the great bulk of bird-life has vanished southward, and you toilsomely tread the silent forest, ankle-deep in snow, the world seems lifeless and drear—until you hear the clarion greeting of the golden-winged woodpecker. It is enough to stir the soul of a Digger Indian with a pleasing sense of companionship in life.

It is only the children of the cities who need to be told that woodpeckers have two toes in front and two behind, to enable them to cling to tree-bark; that the natural perch of such a bird is the perpendicular trunk of a tree; that sometimes they store acorns in holes which they dig in the sides of decayed trees, not in order that worms in those acorns may develop, but in order to eat the acorns themselves. They nest high up in hollow tree-trunks, which they enter through round holes of their own making.[1]

[1] Those who are specially interested in the habits of woodpeckers may profitably consult a report on "The Food of Woodpeckers" by Prof. F. E. L. Beal, published by the Department of Agriculture in 1895. The exact proportions of the various kinds of food consumed by seven species have been determined by examination of the stomachs of several hundred birds, and the figures quoted later on are from that report.

It is a good thing to feed wild birds of all species that are either useful or beautiful. The woodpeckers are the largest insectivorous birds that remain in the North over winter, and they appreciate friendly offerings of suet or fat pork, nailed high up on conspicuous tree-trunks. In the Zoological Park we put up every winter at least twenty-five two-pound strips of fat pork, for the woodpeckers and chickadees which live with us all the year round.

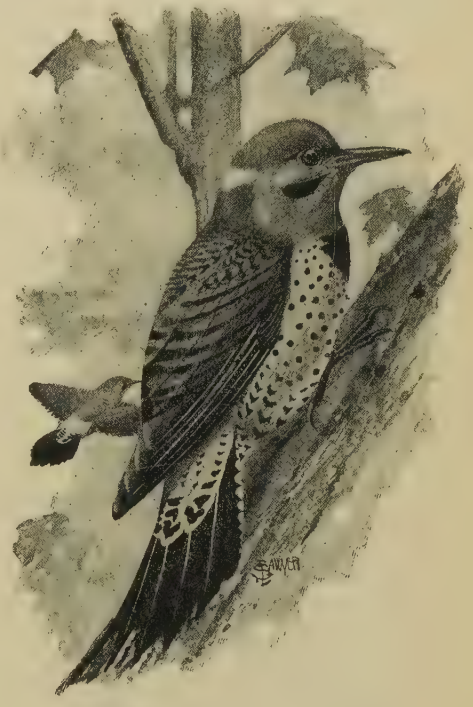
The Golden-Winged Woodpecker[1] is my favorite of the members of this Order. It is a bird of good size, dignified in bearing, decidedly handsome, and a great worker. He loves to hunt insects on the ground, occasionally, but is very alert and watchful, meanwhile. If you approach too near, he leaps into the air, and with a succession of wave-like sweeps upward and downward, his golden wings flash back one of his names as he flies to safety on some distant post or tree. Unlike most birds of this Order, this species frequently perches crosswise on a limb, like a true perching-bird.

This is the woodpecker of many names, some of which are *Flicker*, *High-Hole* and *Yellow-Hammer*. His regular call sounds like "*Cheer up!*" but in spring he gives forth a call which comes very near to being a song. When written out, it is like "*Cook-cook-cook-cook!*" At that season, also, you hear this bird beat the "long roll," on a drum which Nature provides for him in the shape of a hollow tree with a thin, hard shell. The rapidity and force with which the bird strikes the blows producing this sound are almost beyond belief.

An examination of the stomach contents of many specimens of this species showed 56 per cent of insect food, 39 vegetable, and 5 mineral. Of the insect food, ants made up 43 per cent and beetles 10 per cent. The vegetable food represented two kinds of grain (corn and buckwheat), eighteen kinds of wild berries, and fifteen kinds of seeds, mostly of weeds. Out of ninety-eight stomachs examined in September and October only four contained corn. Practically, this bird does no damage to man's crops, but destroys great quantities of harmful insects.

The range of the Golden-Wing embraces the eastern half of the United States to the Rocky Mountains, where it is met by the *Red-Shafted Flicker* of the Pacific slope.

The Red-Headed Woodpecker[2] need not be described, because, in "Hiawatha," Longfellow has immortalized it. This bird, "with the crimson tuft of feathers," was the identical Mama which gave Hiawatha the timely tip which enabled him to put the finishing touch to old Megissogwon, and so end in triumph "the greatest battle that the sun had ever looked on."



GOLDEN-WINGED WOODPECKER.

As a return for this kindness, Hiawatha did the one mean act of his life. He took Mama's little red scalp, and "decked" his pipe-stem with it,—as coolly as if he had been a modern servant-girl decorating a forty-nine-cent hat.

This is a very showy bird, and recognizable almost as far as it can be seen,—brilliant crimson head and neck; white breast, sides and rump, and jet-black back and tail. In the Mississippi Valley, thirty years ago, this was one of the most common birds. Now, thanks to man's insatiable desire to "kill something" that is un-

[1] *Co-lap'tes au-ra'tus lu'te-us.* Length, about 12 inches.

[2] *Mel-an-er'pes e-ryth-ro-ceph'a-lus.* Length, 9½ inches.

protected, it has been so greatly reduced in number that it is seldom seen. It is an omnivorous feeder, eating insects, fruit, beech-nuts, corn and other grain, according to necessity. Its cry is loud and far-reaching, and sounds like "*Choor! Choor!*" As to migrating, it seems unable to make up its mind whether to become a "regular migrant" or a "winter resident."

RED-HEADED WOODPECKER.

Sometimes it migrates southward during the early winter, and sometimes it winters in the North.

An examination of the stomachs of one hundred and one Red-Headed Woodpeckers revealed 50 per cent of animal food and 45 per cent vegetable. Of the former, ants made up 11 per cent, and beetles 31 per cent. The fruit and vegetable food represented five kinds of cultivated fruit (strawberries, blackberries, cherries, apples and pears), and fifteen kinds of wild fruit and seeds. The insect food consisted of ants, wasps, beetles, bugs, grasshoppers, crickets, moths, caterpillars, spiders and thousand-legged worms. In the fruit season, the Red-Head undoubtedly does considerable damage to fruit crops, more by mutilating fruit, perhaps, than by actual loss through fruit wholly consumed; and if these birds were as numerous as sparrows, it would be necessary for fruit-growers to take precautions against them during the fruit season. The damage done to corn appears to be quite insignificant. (Professor F. E. L. Beal's report.)

The great fondness of the Red-Head for beech-nuts, and its habit of storing them up for winter use, in holes and crevices, are well known.

The Ant-Eating Woodpecker[1] of the Pacific slope is the most conspicuous and interesting bird of this Order in that region, either around the suburban home, on the ranch, or in the mountain forests. This is the species which is now celebrated in word and picture for its habit of digging hundreds of holes in soft bark or dead tree-trunks, and "storing" an acorn in each hole, for future food.

The Downy Woodpecker[2] is a small gray-and-black species, modest and quiet in demeanor, but quite as common about the haunts of man as the golden-wing. It is the smallest species found in the United States and is the one which is most in evidence in winter.

This bird ranks high as a destroyer of insects, and in the percentage of insect food consumed leads all other woodpeckers that have been studied by the Biological Survey of the Department of Agriculture. An examination of one hundred and forty stomachs revealed 74 per cent of insect food and 25 of vegetable. The vegetable food consisted chiefly of seeds of the poison ivy, poison sumac, mullen, poke berries, dogwood and woodbine. The fruits consisted of service berries, strawberries and apples.

Apparently this bird is almost worth its weight in gold to the farmer who has valuable trees and fruit; and in winter, the farmer who is wise will put up suet, fat pork, and bones bearing some raw meat, on the trees in his orchard and woods.

[1] *Mel-an-er'pes for-mi-civ'o-rus.*

[2] *Pi'cus pu-bes'cens me-di-an'us.* Length, 7 inches.

The Hairy Woodpecker[1] is so closea counterpart of the downy, in appearance and habits, that it is unnecessary to describe both. The former is larger, but its rank as an insect exterminator is a little lower. Its proportion of insect food is 68 per cent, and vegetable, 31 per cent. Of the former, ants make up 17 per cent, beetles 24 per cent, and caterpillars 21 per cent. The only cultivated fruits found in eighty-two stomachs were blackberries; but wild fruits were well represented.

This bird inhabits practically the same region as the downy woodpecker, and belongs in the ranks of the farmer's best friends.

The Yellow-Bellied Sapsucker[2] is practically the only woodpecker which inflicts serious damage upon man's property; and possibly it may in some localities become so numerous as to require thinning out. Any bird which deliberately girdles a tree and kills it is a bird entitled to serious consideration, and punishment according to the harm it does.

This bird eats great quantities of insects, but as dessert it is fond of the sap of certain trees, among which are the maple, birch, white ash, apple, mountain-ash and spruce. Into the soft, green bark of these trees, this Sapsucker drills small, squarish holes, that look like gimlet holes. Usually they are placed in a horizontal line, and sometimes in mathematical groups. Occasionally several lines of these holes will quite girdle a tree. The bird not only drinks the sap that exudes, but he lies in wait to catch the winged insects and ants that are attracted to the sweet fluid, and devours great numbers of them.

Dr. C. Hart Merriam, who has closely observed the work of the Sapsucker, states that frequently mountain-ash trees are girdled to death by this bird, but that trees of greater endurance, like the apple and thorn-apple, are more able to survive its attacks. Another observer, Mr. Frank Bolles, declares that in well-wooded regions the damage it does is too insignificant to justify its destruction. Mrs. Mabel Osgood Wright states that in Connecticut "where these birds are plentiful, many orchard-owners cover the tree-trunks with fine wire netting."

"This species," says Professor Beal, "is probably the most migratory of all our woodpeckers, breeding only in the most northerly parts of the United States, and in some of the mountains farther south. In the fall it ranges southward, spending the winter in most of the eastern states. It is less generally distributed than some of the other woodpeckers, being quite unknown in some sections, and very abundant in others."

In its general color-scheme, this is a bird of many and much-mixed colors—black, white and yellowish indescribably varied—both above and below. The top of the head and the throat

DOWNY WOODPECKER.

are bright red; and the sides of the head have two broad streaks of white, and two of black. The name of the bird is derived from the predominating greenish-yellow color of its breast and abdomen.

The Pacific coast has the *Red-Naped Sapsucker*, a subspecies of the above, of similar tree-girdling habits; the *Red-Breasted Sapsucker*, one of the commonest woodpeckers found from Oregon to Lower California, and two others,—the *Northern Red-Breasted* and *Williamson's*.

[1] *Dry-o-ba'tes vil-lo'sus.* Length, 10.50 inches.
[2] *Sphy-ra-pi'cus va'ri-us.* Length, 8.25 inches.

CHAPTER XIX

THE ORDER OF CUCKOOS AND KINGFISHERS

COCCYGES

This Order (pronounced Coc'-si-jēz) represents an effort to find a place for three familiar Families of birds whose members have something in common, yet in their most noticeable features are widely different. Both in their structure, habits and mode of life, the kingfisher and cuckoo are widely different from each other; and if there is one really good reason why these birds should be placed in the same Order, the writer would be pleased to have it pointed out. Their feet are totally different, and so are their beaks, their tails and their plumage. Any future revision of the classification of birds should strike this Order, early and hard.

THE CUCKOO FAMILY.

Cuculidae.

The Yellow-Billed Cuckoo,[1] or **Rain-"Crow,"** will fitly represent the Cuckoo Family. It looks like an insect-eating perching-bird, and

YELLOW-BILLED CUCKOO.

in reality it is one! You can easily recognize it by its extreme length and slenderness, the fan-like shape of its tail when spread, its upper surface of glossy drab—or gray-brown—and its white under surface from throat to tail. To carry out this color-scheme to its logical sequence, the upper mandible is dusky brown, and the lower one is yellow.

This bird derives one of its common names—Rain-"Crow"—from the fact that its peculiar cry is heard oftenest on still and cloudy summer days,—two conditions which to the weather-wise farmer always portend rain. Its cry is a weird, gurgling note which sounds like "Cowk-cowk-cowk-cowk!" and usually it comes from the heart of a thick bush or tree which effectually screens the bird. It seems to be fully aware of the dangers which beset all birds which attempt to live in the open with civilized man, for it lives amid the forest shadows.

This bird, and also its twin species, the **Black-Billed Cuckoo,** lives almost wholly upon insects. Of one hundred and fifty-five Cuckoo stomachs examined by the Department of Agriculture, only one contained any vegetable food—two small berries. Nearly half the Cuckoo's food proved to be caterpillars, 2,771 of which were found in 129 stomachs. It was not uncommon for one bird to contain more than 100 of them. "During May and June, when tent-caterpillars are defoliating the fruit-trees, these insects constitute half of the Cuckoo's food."

The stomachs examined contained remains of sixty-five species of insects, in the following percentages: beetles, 6; bugs, 6½; grasshoppers, 30; caterpillars, 48½; other insects, such as web-worms, tussock-moths, army-worms, and moth larvae, 9.

From the results of this investigation it is clear that our two species of Cuckoo are to be numbered with the farmers' best friends among birds. As an estimate, I should say that each of these birds that enters a section devoted to farming and fruit-growing is worth to that section about $10 per season. The charge that Cuckoos devour

[1] *Coc-cy'zus americanus.* Length, about 12 inches.

the eggs or egg-shells of other birds was proven by the finding of shells "in several stomachs, but only in very small quantities—no more than was found in the stomachs of nearly every species that has been examined." Thus the offence charged proves to be too trivial to consider.

The Yellow-Billed Cuckoo inhabits the eastern half of the United States to the Great Plains, and the Black-Billed ranges westward to the Rocky Mountains, from Canada to the tropics. From the Rockies to the Pacific, and up to British Columbia, is found the *California Cuckoo*, a close counterpart of the Yellow-Billed species.

The Road-Runner, or **Chaparral Cock,**[1] is a very strange bird; and many strange "yarns" have been told of it. It is remarkably odd in form, and also in its habits. It is about the size of a small crow, with a tail as long as its entire body and head, and legs that are so long and strong they seem like those of a grouse, save that the toes are longer. The body is slender, but the neck and head are large, and the head has a conspicuous crest. The beak is large. Although this bird has wings, it seldom uses them, and they must be constantly growing smaller through disuse.

This strange bird is a habitant of the Southwest, from Texas to southern California and southward, and lives on the ground, in the low, dry brush which is called chaparral (shap-a-ral′). It feeds upon every living thing inhabiting that region which it can catch and swallow,—mice, lizards, small snakes, centipedes and insects. It is one of the most nervous birds imaginable,—suspicious of everything that moves, and ready to make off without stopping to reason why.

It exhibits a decided preference for the smooth trails and paths through its beloved chaparral, and when alarmed it does not rise and fly, but makes off running, in the trail. It runs with great swiftness and seeming ease, but Dr. D. T. MacDougal has been informed that Mexican boys sometimes run them down, on foot, and either kill them with sticks or catch them alive.

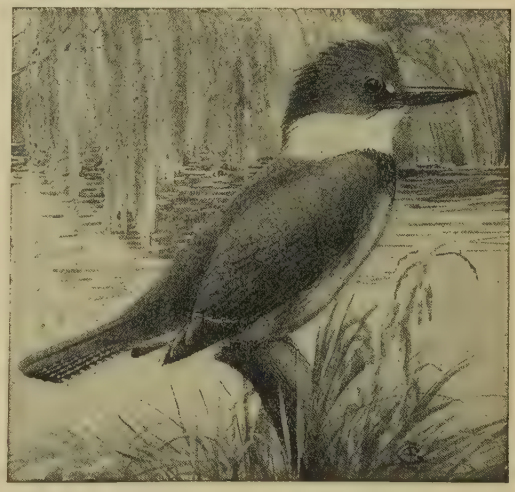
This bird is also great at leaping, as we have seen in keeping it in captivity. Instead of flying to the top of a cedar-tree perch six feet high, and down again, it always leaps, with closed wings; but in leaping up it prefers to take a short run to acquire momentum. If this bird goes on ten thousand years in its present habits, by the end of that period its descendants probably will be without the power of flight, but provided with legs and feet so strong and full of spring that they can leap twenty feet.

[1] *Ge-o-coc′cyx cal-i-for-ni-an′us.* Length, 21 to 23 inches.

THE KINGFISHER FAMILY.

Alcedinidae.

This family is widely and beautifully represented in the Malay Archipelago, but only three species are found in the United States. The **Belted Kingfisher**[2] is of almost universal distribution throughout North America, from the arctic Barren Grounds to Panama and the West Indies. Go where you will, in its season, where small fish abide, there will you find it. It is dignified, handsome, alert, and a true sportsman. Its favorite perch is a dead limb over



THE BELTED KINGFISHER.

still water, from which it can command a wide view, and swoop to the surface of the water in five seconds of time. You will know it by its bright blue upper surface; high and saucy crest; long, dagger-like beak; white under surface and broad belt of blue around the upper breast. Its cry is a metallic rattle, like "*Churr-r-r-r-r-r!*" and its food is small fish. It nests in a hole dug several feet horizontally into a perpendicular bank of earth, near water, or in a hollow tree.

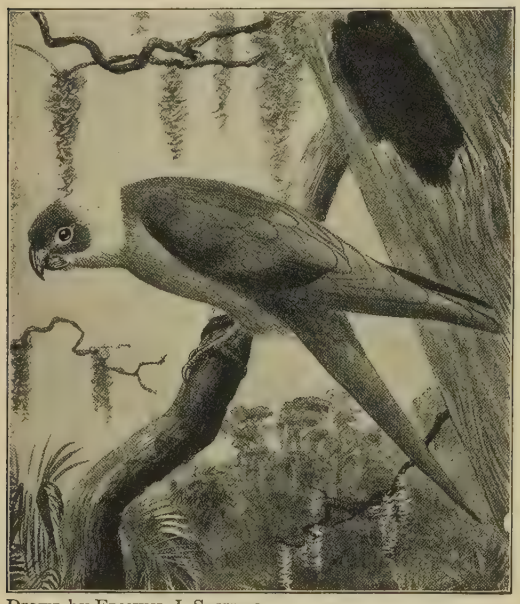
[2] *Cer′y-le al-′cy-on.* Length, about 12 inches.

CHAPTER XX

THE ORDER OF PARROTS AND MACAWS

PSITTACI

The parrots, parrakeets, macaws and cockatoos form a large group, containing in all more than 500 species. Of these, about 150 inhabit the New World, but only one species is found in the United States. South America contains the greatest number of species; Africa and Asia are but poorly supplied, and Europe has none. The widest departures from the standard types are found in New Zealand and Australia.



Drawn by EDMUND J. SAWYER.

CAROLINA PARRAKEET.

Although these birds are by nature thoroughly tropical, some of them range far into the temperate zones. This Order contains a larger proportion of beautifully colored birds than any other. Among the parrots, parrakeets, macaws and lories, there is a lavish display of brilliant scarlet, crimson, blue, green, yellow and purple, while all save a few of the cockatoos are snowy white.

The members of this Order are specially distinguished by their bills and feet. Of the former, the lower mandible is a short but powerful gouge, while the upper mandible is a big hook, with a thick and heavy base, and a long, sharp point.

The foot of a bird of this Order is evenly divided, with the second and third toes pointing forward, and the first and fourth pointing back. The tails of most parrots are rather short, and square at the end, and the legs are very short. With but one or two exceptions, all the 500 species of this Order feed upon fruit, seeds and flowers.

The Parrots are celebrated by reason of the natural inclination of some species to mimicry, and their ability to learn to talk. They are naturally sedate and observant, possess excellent memories, and are fond of the companionship of man. The broad, fleshy tongue of a parrot renders possible the articulation of many vocal sounds, and when a certain phrase is endlessly repeated to a parrot that is secluded from other sounds, the bird is sometimes moved to remember and repeat them. The *African Gray Parrot* is the most celebrated talker, and its value is from $15 upward. Next in rank comes the Mexican *Double Yellow-Head*, although the *Carthagena Parrot*, being a good talker and a more hardy bird, is rapidly becoming more popular. Of both these species, the price in the New York bird-stores is from $10 to $12.

The parrot of the most remarkable habits is the **Kea**, of New Zealand, a bird with very large and strong feet, which not only loves fresh mutton, but sometimes kills sheep on its own account, for food purposes.

The Parrakeets are really small, trim-built parrots, with long, sharp-pointed tails. Excepting the Thick-Billed Parrot, which has been seen in southern Arizona, this Family contains the only member of the Order Psittaci which

inhabits the United States. The **Carolina Parrakeet**[1] once ranged northward in summer to Maryland, Lake Erie and Iowa, and as far west as Colorado; but now all that is only so much history. The hand of the destroyer has been heavy upon this pretty bird. To-day it is totally extinct. In 1893, one of the last flocks, of about thirty birds, which nested on the Sebastian River, Florida, was completely destroyed in one night by a local hunter, who captured the entire flock, and sent the birds to a New York dealer, in whose hands all those which reached him alive died in a short time.

In color this bird has a bright green body, and yellow head and neck. It feeds upon fruit and seeds, and nests in hollow trees.

The Macaws are large, showy birds with very long, pointed tails, and the most awful voices for screeching ever made for feathered folk. They are found only in the New World from Mexico to Paraguay, and in the Andes up to 10,000 feet. Either in flight, or at rest in the green tree-tops, they are exceedingly showy and attractive birds, and to find a flock in the depths of a tropical forest is an event to be remembered. In hunting macaws in the delta of the Orinoco, about every fourth bird that was mortally wounded would hook its beak over a small branch, die, and hang there until I would be reluctantly compelled to make my fellow-collector, who was a good climber, climb up to the bird and throw it down, with much anger and unnecessary violence.

It is a pity that such beautiful birds should have such ear-splitting, nerve-racking voices. Although they seldom can be taught to talk, never cease to scream until dead, and are very apt to bite most unexpectedly, they are often kept as household pets.

The Blue-and-Yellow Macaw,[2] orange yellow below and cobalt blue above, is one of the species most frequently seen in captivity. In the bird-stores of New York, they sell at from $10 to $15 each. The *Red-and-Blue Macaw* is another common species. The beautiful plum-colored bird occasionally seen is the *Hyacinthine Macaw*, from Brazil.

The Cockatoos are mostly—but not all—snow-white birds, with lofty and beautiful triangular crests which can be erected at will, with striking effect. They inhabit Australia, Celebes, the Philippines and the southern islands of the Malay Archipelago. They are easily tamed, talk readily, take kindly to training, and become very affectionate and satisfactory companions.

[1] *Co-nu'rus carolinensis.* Length, about 12 inches.

[2] *Ar'a ar-a-rau'na.* Length, about 30 inches, of which the tail constitutes about 18 inches.

CHAPTER XXI

THE ORDER OF BIRDS OF PREY

RAPTORES

To every farmer and poultry-raiser, the birds of this Order are divided nto two groups, friends and enemies. Inasmuch as feathered friends are to be encouraged, and all enemies slain, the standing of each species becomes a life-or-death matter. America is a wide and populous country, and despite the labors of the Biological Survey of the Department of Agriculture, there are yet millions of persons who desire precise information regarding our hawks and owls. Because of the economic importance of the subject, we will devote a liberal amount of space and effort to the important members of this group. The Families of the Order are as follows:

	FAMILIES.		EXAMPLES.
ORDER RAPTORES.	BARN-OWLS, .	*STRI-GI'DAE*, . .	Barn, or Monkey-Faced Owls.
	HORNED OWLS,	*BU-BON'I-DAE*, .	Horned, Burrowing, Snowy and Screech-Owls.
	HAWKS, . . .	*FAL-CON'I-DAE*, .	Hawks, Kites, Buzzards and Eagles.
	VULTURES, . .	*CA-THAR'TI-DAE*,	California, Turkey and Black Vultures.

THE BARN-OWL FAMILY.

Strigidae.

It is now a well-established fact that "owls are among the most beneficial of all birds," inflicting little damage upon the producers of poultry, and conferring vast benefits upon the farmer by the destruction of mammal and insect pests. Inasmuch as their regular working hours are from sunset to sunrise, they wage successful war on the nocturnal mammals which remain quiet during the daytime in order to escape hawks and other daylight enemies.

Owls are exceedingly interesting birds, and in them there is also much to admire. They take life seriously; they have but few nerves, and seldom use them. Rarely do they become really tame or affectionate, but easily become very indignant at real or fancied affronts. Like many people of few words and solemn manner, they are not nearly so wise as they look. They are easily caught in steel traps, or shot; and they are much given to nesting in situations that are wide open to attack.

Omitting the subspecies,—which are only geographic races,—there are eighteen species of owls in North America, north of Mexico. They vary in size from the tiny elf-owl, of Arizona, only 6 inches in total length, to the great gray owl, of the arctic regions, 30 inches long.

With the exception of the great horned owl, the owls of our country are by no means so destructive to poultry and wild bird life as is generally supposed. The great majority of the species feed upon wild mice, rats, squirrels, shrews, fish, crustaceans and insects; and some of them render great service to man. Nearly all owls are night-flyers, and by reason of their soft, fluffy plumage, which renders their flight quite noiseless, they are specially fitted to keep in check the grand army of destructive rodents that roam abroad under cover of darkness.

Owls do very well in captivity, provided they are properly housed and fed, and have comfortable perches to sit upon. Naturally, they are most active at night, and quiet in the daytime. Be it known, however, that they cannot live long on a steady diet of beefsteak. Every

owl must have a liberal allowance of small birds, like English sparrows, and, if possible, an occasional small mammal, in each case with the feathers or hair upon it. Nature has constructed the owl to devour its prey entire,—feathers, hair, bones and all, on the spot where it is captured.

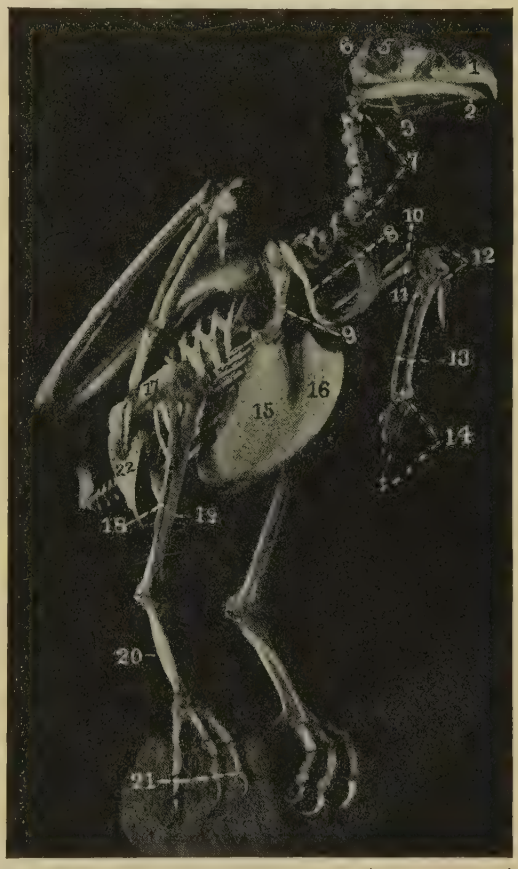
By a curious rotary action of the stomach, all the desirable elements are extracted and assimilated, and the indigestible refuse—hair, feathers, bones, claws, etc.—is rolled into a ball called a "pellet," which is cast up, and expelled through the mouth. These pellets are sometimes collected at roosting-places, and when carefully examined by expert zoologists, it is possible to identify most of the animal remains, and tell what the bird has fed upon.

The Barn-Owl, or **Monkey-Faced Owl,**[1] is the most oddly shaped of all the owls; it has the smoothest and most compact plumage, and proportionately the longest legs. Its general color is that of scorched linen—light brownish-yellow. Each small black eye is the centre of a sunburst of radiating feathers, and the whole face is surrounded by a heart-shaped ring of brown.

The Barn-Owl is to rats and mice as the cuckoo is to the caterpillar. As a destroyer of the meanest vermin on earth (rats) this bird has no equal. Whether North or South, in the tropics or the temperate zone, it loves to live under the roofs of civilized man, especially in church belfries, where it is not molested. In the town of Barrancas, at the head of the Orinoco delta, some Venezuelan boys piloted me into the best church in the place, showed me two Barn-Owls nesting over the altar, and urged me to shoot them then and there. My refusal because the birds were very thoroughly in sanctuary was with difficulty comprehended.

Many observations on the food habits of this bird have been made by examining the pellets that have been gathered from its roosting place. In June, 1890, Dr. A. K. Fisher collected 200 pellets that had accumulated from two birds that roosted and nested in one of the towers of the Smithsonian building. These contained 454 skulls, of which 225 were of meadow-mice, 2 of pine-mice, 179 of house-mice, 20 were of rats, 6 of jumping mice, 20 shrews, 1 star-nosed mole and 1 vesper-sparrow.

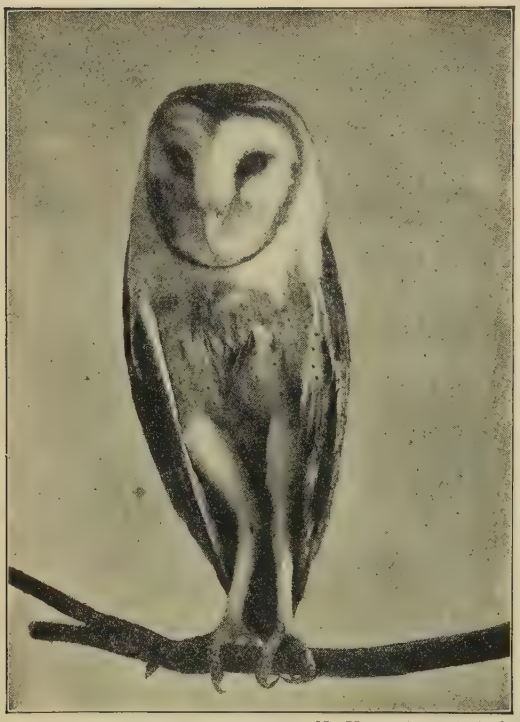
The Barn-Owl rarely molests birds—probably never does so except when forced by hunger—and all over the world, wherever it is found, its favorite food is rats and mice. The number an industrious pair will destroy in a year is really very great, and this species deserves the most careful protection that man can give it. Fortunately, it and its subspecies are very widely distributed,—more cosmopolitan, in fact, than any other owl, save the short-eared.



SKELETON OF A BIRD OF PREY. (BALD EAGLE.)

1, Upper mandible,
2, Lower mandible,
3, Hyoid,
4, External nostril,
5, Orbit,
6, Occiput,
7, Cervical vertebrae,
8, Clavicles,
9, Coracoid,
10, Ulna,
11, Radius,
12, Carpals,
13, Metacarpals,
14, Digits,
15, Sternum,
16, Keel of sternum,
17, Pelvis,
18, Fibula,
19, Tibia,
20, Tarsus,
21, Digits of foot.

[1] *Strix pra-tin'co-la.* Length, from 15 to 17 inches.



N. Y. Zoological Park.
BARN-OWL.

THE HORNED-OWL FAMILY.

Bubonidae.

The Long-Eared Owl[1] looks like a small and imperfect imitation of the great horned owl. It can always be distinguished by its small size, and the fact that its horns appear to have been set too close together on the top of its head, and do not fit very well. Its total length is about 15 inches, and its general color is a fine mottling of gray, tawny and black, which produces a brownish-gray bird. It is found all over the United States.

The food of this very useful bird consists mainly of mice. In April, 1888, at Munson Hill, Virginia, Dr. Fisher collected about 50 pellets from under a tree in which a Long-Eared Owl had roosted, and found that they contained the following remains: 95 meadow-mice, 19 pine-mice, 15 house-mice, 5 white-footed mice, 3 Cooper's mice, 26 short-tailed shrews and 13 birds. Of the birds, there were 11 sparrows, 1 blue-bird and 1 warbler. Of this species Dr. Fisher says: "It is both cruel and pernicious to molest a bird so valuable and innocent as the one under consideration."

[1] *A'si-o wil-son-i-an'us.*

The Short-Eared Owl[2] is of about the same size as the preceding species, but its ears are so short that they look like two small feathers that have been thrust carelessly into the plumage directly above the eyes. Above it is a brownish-yellow bird, and buffy white underneath. It is found from the arctic regions of North America to Patagonia, and throughout nearly the whole of the Old World except Australasia. Its food habits are very similar to those of the long-eared owl, and it is equally deserving of a perpetual close season.

The Barred Owl[3] has not quite so good a reputation as the three noticed above, but its record is by no means bad. Out of 100 stomachs examined by the Biological Survey, three contained domestic fowls, one a ruffed grouse and one a pigeon. Six contained screech-owls, one a saw-whet owl, three held sparrows, one a woodpecker, and two small birds were not identified. Against this debit was a credit of 46 mice, 18 other small mammals, 4 frogs, 1 lizard, 2 fishes, 2 spiders, 9 crawfish and 20 empties. The eighteen small mammals consisted of 5 red

BARRED OWLS.

squirrels, 1 flying squirrel, 1 chipmunk, 4 rabbits, 2 shrews, 2 moles, 1 weasel and 2 rats.

Owing to the increasing scarcity of its natural

[2] *A'si-o ac-cip-i-tri'nus.* Length, from 14 to 16 inches.

[3] *Syr'ni-um va'ri-um.*

diet of wild mice, chipmunks, squirrels, frogs and other food, this owl has, in the author's opinion, changed its habits, and now, like the great horned owl and screech owl, is so fiercely killing song-birds that it deserves to be ranked as a scourge, and shot whenever possible. The success of this owl in catching and devouring caged song-birds through one-inch-mesh wire netting is astonishing.

The Barred Owl is next in size to the great horned owl. It is from 20 to 22 inches long, heavy-bodied, round-headed, and quite without "horns," or "ears." Its head, neck and breast are marked by many black horizontal bars on a gray or creamy-white ground, and the breast and abdomen have a few thick, perpendicular bars. Many times a big Barred Owl of my acquaintance has exclaimed to me through the darkness, in a fearfully hollow and sepulchral voice,—"Whò? Whó-whó-whó-whó-*whó*-whó? Ah!" It is like the war-cry of an angry ghost.

This bird ranges throughout the eastern half of the United States, and westward almost to the Rocky Mountains; and it frequently finds its way into captivity.

The Great Gray Owl[1] is the largest member of this Family found in the New World. It is an arctic bird, one-fourth larger than the great horned owl, and even in winter has never wandered farther south than the Ohio River. In Alaska and British Columbia it inhabits the timbered regions, and does not wander far into the treeless Barren Grounds. Anyone who captures a very large owl of a dusky brown or dusky gray color, larger than a great horned owl, but with *no ear-tufts*, may know that he has secured a specimen of the rare and handsome Great Gray Owl.

The Saw-Whet Owl[2] is a very small Owl, and so shy that few people ever see it; but it feeds almost *exclusively upon mice*, and any bird which wages perpetual war on those pests deserves honorable mention in these pages. In appearance it looks very much like a small gray-phase screech-owl without ears. It may be looked for—but it will seldom be found—almost anywhere in the United States from the international boundary to the Gulf States and California.

[1] *Sco-ti-ap'tex neb-u-lo'sa.* Length, 25 to 30 inches.

[2] *Nyc'ta-la a-ca'di-ca.* Length, 8 inches.

The Screech-Owl[3]—with an awful shiver in its voice, but *no screech* whatever—is so widely distributed, and so easily affected by climatic variations, that the original species has been split up into eight varieties, or subspecies. Thus we now have the Texas, California, Rocky Mountain, Mexican, and Florida Screech-Owls, and others too numerous to mention. The differences between all these are not very great. Let each American know his own Screech-Owl, and study its habits, and he will then know the others, quite well enough for all practical purposes.

To me, the cry of this little Owl is one of the most doleful sounds in animated nature, not even excepting the howl of a wolf. It is like the

N. Y Zoological Park.

SCREECH-OWL.

quivering, shivering, heart-broken wail of a lost spirit, and suggests chattering teeth and freezing vocal chords. Written out it is "*Woe-woe-woe-woe-woe-woe-woe* ah!" But no phonetic spelling can even suggest the high-pitched mental and physical anguish expressed in the cry that one hears.

The Screech-Owl is a round-bodied little fellow, sometimes almost as broad as it is high; and its head is surmounted at the corners by very respectable ears. In its gray phase, this bird looks very much like a dwarf great horned

[3] *Meg'as-cops a'si-o.* Length, 7 to 9 inches.

owl; but of course the black markings are not the same.

This Owl exhibits a peculiarity in color which must be specially noted. It has two distinct and widely different colors, red and gray. In the same locality will be found owls that are of a cold, black-and-white gray color, and others that are pale, rusty red, with white mottlings on the abdomen. For this very odd development, we are quite unable to account; and such

SANBORN, Photo., N. Y. Zoological Park.

YOUNG SCREECH-OWLS.

lawless color-variations are called "phases," possibly because they phase the naturalists who try to study out their whys and wherefores.

In its food habits, the Screech-Owl prefers, if it can procure them, mice, grasshoppers, locusts, cut worms, beetles, caterpillars, crickets, spiders, lizards, frogs and crawfish. If these are lacking, it attacks the English sparrow and almost any other small bird that comes handy, usually other sparrows. To show that when very hungry all birds look alike to him, he occasionally kills and eats a bird of his own species! Dr. A. K. Fisher's ever useful and scholarly report on the "Hawks and Owls of the United States" sets forth in full detail the results of the examination of 255 stomachs of Screech-Owls, of which the following is a summary of contents: 100, insects; 91, mice; 12, English sparrows; 26, other birds; 11, miscellaneous mammals; 9, crawfish; 7, miscellaneous food; 5, spiders; 5, frogs; 2, lizards; 2, scorpions; 2, earth-worms; 1, poultry; 1, fish, and 43 were empty. The following is a full list of the birds found: 12 English sparrows, 9 other sparrows, 3 juncos, 2 Screech-Owls, 1 shore-lark, 1 water thrush and 15 unrecognized.

Leaving out the two Screech-Owls, of the birds that were identified, the English sparrows formed practically one-half. On this basis we will allow that of the unrecognized birds, seven were song-birds. Add these to the fifteen recognized-song birds and we have a total of twenty-one song-birds out of two hundred and fifty-five stomachs examined.

The question is, what shall be the fate of the Screech-Owl,—encouragement, toleration, or limitation? To me it seems that the number of Screech-Owls should be *limited*, for the benefit of the song-birds; but I do *not* believe in their extermination.

The Great Horned Owl[1] is, by necessity, an aerial pirate and highway robber—the tiger of the air. Its temper is fierce and intractable, and if you attempt to make friends with one in captivity, it will hiss like a snake, snap its beak like an angry peccary, and dare you to come on. Of all the birds I know, there is no other so persistently savage in captivity as this bloody-minded game-killer. Of course, the Owl is not to blame for the raw-meat appetite which Nature gave him, and for which he feels bound to provide; but there is no reason why he should have a temper like a black leopard toward those who feed him.

"Of all the birds of prey, with the exception possibly of the goshawk and Cooper's hawk," says Dr. A. K. Fisher, "the Great Horned Owl is the most destructive to poultry. All kinds of poultry seem to be taken, though when Guinea-fowls and turkeys are obtainable, it shows a preference for these. In sections of the country where it is common, the inhabitants complain bitterly of its ravages." In the museum of the Philadelphia Academy is an Owl which carried off from one farm twenty-seven individuals of various kinds of poultry before it was shot.

[1] *Bu'bo virginianus.* Length, from 20 to 24 inches.

GREAT HORNED OWL.
With "horns" laid back in anger.

But let us give even the Horned Owl its just due. Mr. O. E. Niles, of Ohio, once found in a nest of this bird "several full-grown Norway rats with their skulls opened and brains removed," and on the ground under the tree which contained the nest he found "the bodies of *one hundred and thirteen rats*, most of them full grown!" Now, in the course of a year, would not one hundred and thirteen Norway rats consume and destroy enough grain to feed one hundred and ten head of poultry?

This is the summary of the contents of 127 stomachs of Great Horned Owls examined by the Biological Survey: 31 contained poultry or game-birds; 8 contained other birds; 13 contained mice; 65 contained other mammals; 1 contained a fish; 1 contained a scorpion; 10 contained insects, and 17 contained nothing.

The bird-food represented the following: 21 domestic birds, 11 song-birds, 3 ruffed grouse, 2 quail, 1 pinnated grouse, 1 pigeon, 1 rail, 1 wild duck, 1 Cooper's hawk, and 2 unknown.

The mammals found were as follows: 46 mice and rats, 32 rabbits and hares, 7 shrews, 5 squirrels, 3 chipmunks, 4 pocket-gophers, 2 skunks, 1 weasel and 1 bat.

Beyond question, the debit balance against this bird is heavy, and justifies its destruction, wherever found; but at the same time, it goes against the grain to kill a bird which destroys so many rats.

The Great Horned Owl, or Hoot-Owl, as it is frequently called, is a bird of dignified and imposing appearance. Its big, round-topped horns of feathers are singularly like cats' ears in shape, and when with these are seen the fiercely-glaring eyes of yellow and black, the half-yellow face and fluffy white feathers on the throat, the whole head of this bird is singularly like that of a Bengal tiger. The body plumage is a complex mottling and barring of black and brown, dull yellow and white, impossible to describe successfully.

But this bird can always be recognized by its large size, cat's-ear "horns," and the fine, black horizontal bars across its breast-feathers. From wing to wing, across its upper breast there is an assemblage of heavy splashes of black.

The eastern Great Horned Owl is the type species on which are based the *Western, Arctic, Dusky* and *Pacific* Horned Owls, which in com-

Photographed by E. R. Warren.

YOUNG GREAT HORNED OWLS.

bination cover practically the whole of North America down to Costa Rica. By reason of the live food available in winter, these birds are not migratory.

The Snowy Owl[1] is a bird of the Arctic wastes, and reaches the northern United States only as a winter visitor. Its occurrence with us varies from a total scarcity during some years to an abundance during others. During December, 1886,—the beginning of the awful winter which killed over 90 per cent of the range cattle in Montana,—we saw in the country in which we

Photo. by C. William Beebe, N. Y. Zoological Park.

SNOWY OWL.

were hunting buffalo, in central Montana, at least twenty-five Snowy Owls. They were living on hares, rabbits, and sage-grouse, out in the open, twenty miles from the nearest timber. It was their habit to alight upon the tops of the low buttes, in reality upon the ground, from which they could survey a wide circle of sage-brush plains. Whenever there is an annual "flight" of Snowy Owls, they are always particularly numerous in Minnesota.

But for its perfectly round and rather comical-looking head, this bird would be the most beautiful of all American owls. Its plumage varies from almost spotless snow-white, in some individuals, to white barred all over with narrow horizontal bands of black—which is really the standard color-plan. The number and width of the black bands vary exceedingly in different individuals, some birds being rendered much darker than others.

The food of this species consists of every kind of wild bird or small mammal it can catch; but there is no evidence that it ever destroys poultry. In summer, when its far-northern home is full of migratory birds, nesting and rearing their young, its bill of fare is quite varied, but in winter it is confined to such winter residents as the ptarmigan, hare, rabbit, sage-grouse, and such small rodents as dare to venture forth from their burrows.

With the **Burrowing Owl**[2] of the western plains, the Owl Family may justly be regarded as "run to earth." This odd little owl indeed takes shelter in the mouths of prairie-"dog" holes, but as far as I am aware there is no proof that it ever descends to the bottom of a deep burrow, or that it is chummy with the rattlesnake. It is reasonably certain that no owl in its right mind ever would fraternize with a rattlesnake, and neither would a prairie-"dog."

The Burrowing Owl lives in the plains of the West and Southwest, from North Dakota to southern California. A closely related species is found in Florida, where it easily digs burrows in the sandy soil.

Many persons have the idea that this Owl is unable to dig, and is therefore dependent upon prairie-"dogs" and badgers for a home. This is entirely erroneous. In soil that is reasonably loose, the Burrowing Owl is a most industrious and successful digger, and with his feet flings out the loose dirt and gravel in a shower. A pair of western birds which we kept in the Bird-House of the New York Zoological Park for two years burrowed so deeply into the big pile of solid gravel in their enclosure that its interior became a perfect cavern.

In the land of plains and prairie-"dogs," the Burrowing Owl is a frequent corollary to a "dog" town, sitting on the highest point of a burrow mound; or, if alarmed, taking short flights to the suburbs. Between bird and rodent there ap-

[1] *Nyc'te-a nyc'te-a.* Average length, about 23 inches, the female being larger than the male.

[2] *Spe-ot'i-to cu-nic-u-la'ri-a hy-po'gæ-a.* Average length, about 10 inches.

pears to exist a *modus vivendi*, which is good so long as the bird does not come within reach of the legitimate owner of the soil. As already mentioned (page 77), when the two are intimately mixed, the prairie-"dog" quickly kills the Burrowing Owl. It seems practically certain that the bird inhabits only the mouth of the prairie-"dog's" burrow, or burrows that have been abandoned.

This owl is far too small to kill even a half-grown "dog;" besides which, its favorite diet is grasshoppers, locusts, other insects, lizards and scorpions. It is to be noticed that in thirty-two stomachs examined in Washington, one really did contain a portion of a prairie-"dog," and two contained one mouse each, but thirty-three contained insects only, some of them showing from forty-nine to sixty each of locusts and grasshoppers.

The color of a Burrowing Owl is a grayish mixture, darkest on the back, and lighter below, and the legs are long and naked, like those of a sharp-shinned hawk. In captivity our specimens dug extensive burrows for themselves, in doing which they threw out gravel and earth with astonishing force. They are savage little wretches, and murder each other at a shocking rate. The males fight savagely, and the western species will not live peaceably with that of Florida.

THE HAWKS AND EAGLES.

Falconidae.

This section of the Order Raptores contains a remarkable assemblage of forms, and the wide differences between some of the groups add zest to the study of them. Some are expert in fishing, some are of dignified and imposing bearing, some have beauty of plumage, and one is the most beautiful flyer in all the bird-world. Until only ten years ago, most people regarded all hawks as so many robbers, deserving death.

In 1893, the investigations of the Department of Agriculture revealed the surprising fact that of all the forty-one species of day-flying birds of prey in North America, there were only four species whose destructiveness so far outweigh their useful services that they deserve to be destroyed. The others are either harmless to man's interests, or else so positively beneficial that they deserve careful protection. Beyond doubt, the careful and thorough investigations made by the Biological Survey, under the direction of Dr. C. Hart Merriam, and the publication of the results, have resulted in the correction of popular errors which if persisted in would have caused enormous losses to the farmers of the United States.

As an object lesson, take the case of Pennsylvania.

In 1885, the legislature of that State enacted a law aimed at the wholesale destruction of hawks and owls, and authorizing the various counties to pay cash bounties for the "scalps" of those birds, at the rate of fifty cents each. Immediately the work of slaughter began. Many thousand scalps of hawks and owls were brought in, and over $90,000 were paid out for them. It has been estimated that the "saving" to the agricultural interests of the state amounted to $1 for every $1,205 paid out as bounties! In this manner the balance of Nature was quickly and completely destroyed.

The awakening came even more swiftly than anyone expected. By the end of two years from the passage of the very injudicious "hawk law," the farmers found their field-crops and orchards so completely overrun by destructive mice, rats and insects, they appealed to the legislature for the quick repeal of the law. This was brought about with all possible haste. It was estimated by competent judges that the "hawk law" cost the farmers and fruit-growers of Pennsylvania not less than $2,000,000 in actual losses on valuable crops.

The moral of this episode is,—*it is always dangerous, and often calamitous, to disturb violently the balance of Nature, either by the destruction of existing species of birds or mammals, or by the introduction of new ones.*

The American Osprey, or **Fish-Hawk,**[1] is, by common consent, regarded as a sort of connecting link between the Owl and Falcon Families. It is a good bird to lead a large Family, and it is to be regretted that those who dwell far from the sea-coast and large rivers lack opportunities for becoming well acquainted with it. Surely this bold fisher, who thinks nothing of dropping a hundred feet into ice-cold water, seizing a fish of nearly half his own weight, and

[1] *Pan'di-on hal-i-ae-e'tus carolinensis.* Average length, about 24 inches; weight, 3 pounds.

flying five miles with it, must appeal to every man and boy who loves the grasp of a good rod, and the musical click of a reel.

The boat trip up the Shrewsbury River, from New York to Long Branch, is worth taking in midsummer solely for the sight of the Ospreys, winging slowly over the still lagoon, stalking their finny prey, and anon plunging with a loud

AMERICAN OSPREY.

splash into the water. Sometimes the bold fishers go quite out of sight. The most surprising thing about such performances is the size of the fish that an Osprey can lift and carry away.

In carrying a fish, an Osprey always grasps it on the back, with one talon well ahead of the other, and the head of the fish pointing straight forward. This is to secure a minimum of resistance from the air, and render it an easy matter to steer the prize to the home-nest, or to a tall tree on which it may be devoured at leisure. It is no wonder that a three-pound Osprey carrying a one-pound fish is moved to jettison his cargo when he sees a hostile bald eagle bearing down upon him with empty claws and his decks cleared for action.

The story of the Ospreys of Gardiner's Island is a most interesting chapter in bird-life. The owner of that island is a relentless enemy to cats and gunners, and a fierce protector of all the wild life on the island, which is wholly his. His weapons are loaded for hunters only, and for several years the Ospreys have bred regularly around Mr. Gardiner's house, and all over the island. A pair of birds occupies the same nest year after year, adding to the mass each year, until the nest contains a wagon-load of sticks of many sizes, and measures six feet in diameter. To-day, strange to relate, some of the Ospreys are nesting practically upon the ground, serenely confident of their security from all harm.

The Osprey is built like a light-weight athlete, all bone, tendon, hard muscle and wing-power, and no fat. Its long, half-naked legs and powerful claws remind one of patent grappling-hooks. The wings are long and acutely pointed, going well beyond the end of the tail. The whole neck and lower surface of the bird is white, but the back, wings, and upper surface of the tail is dark colored, as also is the upper half of the head. The plumage is compact, smooth and oily, as befits a diving-bird.

In summer this bird is at home on the sea-coast from Alaska and Hudson Bay to the Gulf of Mexico, and along a few rivers, but in winter it migrates to southern Florida, the West Indies and northern South America.

The jaunty little **Sparrow-Hawk**[1] is the smallest American hawk, and also the most beautiful. Its form is elegant, and its colors are varied and pleasing. As if desirous of admiration, it tolerates man at shorter range than any other hawk I know. Its cap is dull blue, its throat white with black side-patches, and its upper neck and back are bright rusty brown. Its breast is salmon color, sparingly spotted, its knickerbockers are white, and its tarsi and feet are bright yellow. It inhabits the whole United States, and on northward to Great Slave Lake, but I think it is most plentiful on the prairie farms of the middle West.

As a destroyer of grasshoppers, beetles, crickets, caterpillars and other insect enemies, this little Hawk deserves to rank with the birds most beneficial to man. For so small a bird, the

[1] *Fal'co spar-ve'ri-us.* Length, 9 to 10 inches.

number of grasshoppers it consumes in a year is enormous. It never molests poultry, and when insects are obtainable never kills a song-bird, but it does destroy great numbers of mice. Dr. Fisher reports that of 320 stomachs examined, 215 contained insects; 29, spiders; 89, mice; 12, other mammals; 53, small birds; 1 game-bird, and 29 were empty. Many stomachs contained from 10 to 35 grasshoppers each, and of other insects, from 25 to 40 in one bird was of common occurrence.

It must be noted at this point that when the Sparrow-Hawk is rearing its young, it does sometimes catch young chickens; but the extreme infrequency of this may be judged from the fact that in the entire series of 320 specimens examined at Washington, taken at all seasons from January to December, and throughout a wide range of localities, not one stomach contained any remains of a domestic bird. In the early spring, before grasshoppers come, Sparrow-Hawks often follow a plough very closely, to capture the mice that are ploughed up. Sometimes this bird is half domestic in its habits, and nests in buildings erected by man. Wherever it is found, it should be a welcome visitor.

The Pigeon-Hawk[1] is a slightly larger bird than the preceding, very destructive to song-birds, of little use to man, and deserves to be shot wherever found. It kills sparrows, thrushes, goldfinches, vireos, bobolinks, swifts, and a host of other species. Out of 56 specimens examined by Dr. Fisher, 41 contained small song-birds, and 2 poultry; 2 only had mice, and 16 insects. This is a bird of plain colors, being bluish-gray or brownish above, and lighter below.

Apparently the **Duck Hawk,**[2] a geographic race of the **Peregrine Falcon,** never devours a mouse or an insect save by mistake. Out of 20 specimens, 7 contained game-birds or poultry, 9 had eaten song-birds, only 2 contained insects, and 1 a mouse. You may know this bird by the great size and strength of his "pickers and stealers." It can best be studied with a rope, a basket, and a chokebore shot-gun loaded with No. 6 shot.

First shoot both male and female birds, then collect the nest, and the eggs or young, whichever may be present. In doing this, however, be careful not to shoot the *Red-Tailed* or *Red-Shouldered Hawk,*—both good friends of ours, who are entitled to protection. A Duck-Hawk has *no red nor decided brown* upon it, anywhere. In general effect it is a dull black bird with a white breast and throat, and white abdomen cross-barred with black. It inhabits all of America north of Chili.

The time was when the **Bald Eagle,**[3] or **White-Headed Eagle,** was known to every human being within the limits of the United States. To-day there are probably two million men in this country, speaking foreign languages only, but voting regularly and persistently, who do not know an Eagle from a parrot, nor the number of stripes there are in Old Glory. It is related by a reliable eye-witness that when an escaped parrot recently perched in one of the trees of City Hall Square, New York City, a dispute

SPARROW-HAWK.

[1] *Fal'co col-um-ba'ri-us.* Length of male, about 20 inches; female, 2 to 3 inches more.

[2] *Fal'co per-e-gri'nus an-a'tum.* Length of male, 17 inches; female, 19 inches.

[3] *Hal-i-ae-e'tus leu-co-ceph'a-lus.* Average length of male, about 34 inches; female, 38 inches; spread of wings, from 7 to 8 feet. See plate on page 170.

as to its identity was ended satisfactorily by some who oracularly pronounced it an "eagle bird."

But, no matter how many persons there are in this country who do not know our national bird, I will not humiliate "Old Baldy" by formally introducing him. To every intelligent American, the perfect bird, with its snow-white head, neck and tail, is recognizable at a distance of a mile or more. To see one perching on the topmost branch of a dead tree, overlooking a water prospect, with its snowy head shining in the sunlight like frosted silver, is enough to thrill any beholder. Even when in flight, an eagle can be distinguished from all other birds by its slow and powerful wing-strokes, and the great breadth of its wings, especially near their extremities.

It is unfortunate that this Eagle does not acquire its white head and tail until its fourth year. The head is fully feathered, and the name "Bald" refers solely to its white appearance. Up to three years of age it is of the same general color as the golden eagle, and to distinguish the two species it is necessary to look at the lowest joint (tarsus) of the leg. If it is *naked*, the bird is a Bald Eagle; but if it is covered with feathers quite down to the toes, it is a golden eagle.

As a rule—to which there are numerous exceptions—the White-Headed Eagle is found along rivers, and the shores of lakes and ponds containing fish. Fish are its favorite food, and lambs are purely supplementary. As a regular thing, it catches fish out of the water, with neatness and despatch; but when it sees an osprey flying by with a large fish in its talons, the Eagle does not hesitate to levy tribute on the subject bird. Taken thus at a great disadvantage, the fish-hawk has no option but to drop its fish, and go away to catch another, while the Eagle catches the prize before it touches the water and bears it away.

This act of the Eagle, and the extra trouble it puts upon the fish-hawk in catching duplicate fish, is by a few writers taken seriously to heart. So is the additional fact that Eagles—like many human beings—often eat dead fish that are found floating upon the water, or are cast up on the shore. For these, and other reasons equally weighty (!), it has become almost a fashion among writers to denounce the Bald Eagle, and declare it a shame that such a bird ever was chosen as our national standard-bearer. Some have asserted that the brave and high-minded wild turkey would have been more appropriate!

Against all of this, I have nothing to say. The American Eagle needs no defence from me. Whether

> "He clasps the crag with hooked hands,
> Close to the sun in lonely lands,"

or perches defiantly on the United States coat-of-arms, with a brow to threaten or command, he is beloved by at least seventy-two million people who will rise as one whenever he is really in need of defenders. Abroad, it once was well-nigh an international fashion to flout this bird, and the standard he bears; but since May 1, 1900, that fashion has gone out. Abroad, those who do not respect this bird fear him, wholesomely. At home, it is quite time for all strangers to secure an introduction to him, and for some of those who should be his friends but are not, to write him down no longer.

Originally the range of this Eagle covered the whole of North America from Mexico to Kamchatka. It was abundant from Palm Beach to New York, from Barnegat Bay to Albany, and in the State of Washington, where it once was too numerous. During the first decade of the twentieth century it became so numerous in the lower reaches of the salmon-bearing rivers of Alaska that a great hue and cry was raised against it. As a serious enemy of the always-conservative salmon canners, its destruction was demanded. For the paltry reward of fifty cents that was put upon its head by the Alaska legislature, many thousands were hunted down and slaughtered, and the people of Alaska approved their work. If the birds had been turkey buzzards with smallpox they could not have been treated more despitefully.

To-day, throughout the whole United States the American Eagle is a scarce bird, and growing more so, day by day. You now can travel the whole length and breadth of Florida without seeing even one; which I can testify means a vast falling off since 1900. Old Baldy is passing out, along with the other birds, and it is probable that millions of Americans now living never will see one alive.

In 1904, live Eagles were easily purchasable; now they are difficult to obtain, and costly.

The Golden Eagle[1] is in no sense whatever a golden-colored bird. Its plumage is dark brown, with a very slight outside wash of lighter brown. It would be much more appropriate to call it the "brown eagle." In appearance it looks very much like a white-headed eagle in its second year, except that its tarsi are *feathered quite down to the toes.* By this point it can always be distinguished from its nearest relative.

This bird has a very bad record as a destroyer of lambs, poultry, game-birds, young deer, antelope, rabbits, and other small mammals. It cares very little for fish, and prefers to frequent interior regions, where either domestic animals or wild species of good size are abundant. By preference it is a bird of the mountains, and although found all the way from the Atlantic to the Pacific, and from Mexico to the Arctic Ocean, it is most abundant in the great mountain-ranges of the West. In the cattle country east of the Rockies, many a Golden Eagle dies ignominiously from eating poisoned meat that is intended for wolves.

The Hawks of North America above Mexico form a group of about thirty-four species, not counting subspecies, and the conspicuous types are well worth serious attention.[2] Some of them are useful to man, and some are so destructive and generally useless that they deserve death. It is highly important that hawk enemies should be distinguishable from hawk friends.

The Red-Tailed Hawk[3] is the greatest of all destroyers of noxious four-footed animals. It might well be called the *Mammal-Eater*, instead of being universally miscalled the **Hen-Hawk,** or **Chicken-Hawk**.

The species of the above name inhabits the entire eastern half of the United States, and ranges westward to the Rocky Mountains, where it meets the subspecies known as the *Western Red-Tail.* By reason of the abundance of this bird, and its undoubted influence for good or evil upon agricultural communities, the Department of Agriculture has made a study of it which was particularly thorough. From Arizona to Connecticut, and in all seasons of the year, collections were made, until finally 562 stomachs had been collected and examined.

The result was a complete vindication of the moral character of the previously despised and persecuted "Hen-Hawk." *Two hundred and seventy-eight specimens contained mice;* 131, other mammals; 54, poultry or game-birds; 51, other birds; 47, insects; 37, amphibians and reptiles; 13, offal; 8, crawfish, and 89 were empty. It was found that poultry and game did not constitute 10 per cent of the food of this Hawk, and that all other beneficial creatures preyed upon, including snakes, did not increase this proportion to 15 per cent. Against this small debit stands a credit of 85 per cent, made up chiefly of destructive rodents.

"It is not to be denied," says Dr. Fisher, "that a good deal of poultry is destroyed by this Hawk; but the damage done is usually among the less vigorous fowls, in the late fall, and in view of the great number of injurious rodents as well as other noxious animals which this Hawk destroys, *it should seem equivalent to a misdemeanor to kill one, except in the act of carrying off poultry.* The fact that there are robbers among Hawks is no sound argument for exterminating any and every one."

This bird is very omnivorous in its habits. In the examination noted above, the remains of 35 species of small mammals were found, of which 30 were rodents, 5 were insectivores and 1 (a common skunk!) was a carnivore. Of birds there were only 20 species.

The important markings of the Red-Tailed Hawk are its rusty-brown tail, back and head of blackish-brown, white throat, and light-colored breast streaked with dusky or brown. The *immature bird has a gray tail, crossed by from* 6 *to* 10 *dark bands, and the rusty-red tone of the adult bird is everywhere absent.* The head is large, and rather square in outline at the back.

There are varieties of this bird scattered all over the United States, and under most circumstances it is rather difficult to tell them apart.

[1] *A-quil'a chrys-a-ë'tos.* Size, about the same as the white-headed eagle.

[2] To avoid the possibility of confusion, attention is called to the fact that the sparrow-hawk, pigeon-hawk and duck-hawk, already described, belong to *Falco*, the genus of the falcons, a group quite distinct from those of the hawks now to be introduced.

[3] *Bu'teo bo-re-al'is.* Average length of male, about 21 inches; female, 24 inches.

The Red-Shouldered Hawk[1] has not only "red" shoulders, but also a red head, neck, back and breast. But there are many shades of red, and the so-called red on this bird is as widely different from the red of a cardinal as blue is from green. The so-called "red" on this Hawk is really a rusty brown; and by the great amount of it, the small, round head of the bird, and its *black* tail crossed by about six bands of white, this species may easily be distinguished from the preceding.

SHARP-SHINNED HAWK.

This Hawk is to be counted with the farmer's best friends. Mr. J. Alden Loring knew a pair which for two years nested within fifty rods of a poultry-farm on which were about 800 young chickens and 400 ducks, but never attempted to catch one. Mice constitute two-thirds of its food, but it is very fond of frogs and toads. In the 220 specimens which he examined, Dr. Fisher found the remains of creatures representing eleven classes of life. The food exhibit was made up as follows: 3 stomachs contained domestic fowls; 12, other birds; 102, mice; 40, other small mammals (16 species in all); 20, reptiles; 3, fish; 39, amphibians (frogs and toads); 92, insects; 16, spiders; 7, crawfish, and 1, earthworms.

The service rendered by the Red-Shouldered Hawk consists chiefly in the destruction of mice and grasshoppers; and birds of all kinds are touched very lightly. This species inhabits eastern North America from Nova Scotia and Canada to the Gulf, and westward to the Plains. The Pacific coast contains a variety known as the *Red-Bellied Hawk*, which is quite as honest about poultry as the eastern species.

The Sharp-Shinned Hawk[2] is a swift flyer, a keen hunter, and a great murderer of small birds. Like all the hawks, its upper surface is dark, and its lower surface light. Its tail is long, and has three or four narrow, dark-colored bands across it, far apart, with the widest band nearest to the end. The wings, back, upper neck surface and upper tail are all bluish-gray. The throat and under parts of the body are white, plentifully cross-barred with rusty brown.

This is a small hawk,—next in size to the pigeon-hawk. Its beak seems rather small and weak, but its legs are long and its feet large, and these, backed up by swift flight and great courage and impudence, render this bird a winged terror. It hunts along fences like a dog hunting rabbits, and pursues song-birds into their thickets and out again. Its principal food is song-birds, and only at long intervals does it capture a mouse. This bird is rather too small to handle poultry with complete success.

The complete list of the bird-remains found in 159 stomachs of Sharp-Shinned Hawks constitutes a tale of slaughtered innocents that is appalling. Six stomachs contained poultry, and 99 *contained song-birds*, woodpeckers and a few others. Only six contained mice, and 5, insects; and 52 were empty. Of the wild birds, 56 species were identified. There can be no question regarding the necessity for the destruction of this bird, wherever it is found. It breeds throughout the entire United States, northward to the arctic circle, and southward to Guatemala. (Fisher.) In some localities it is quite abundant.

Cooper's Hawk[3] is a companion in crime to the preceding species, and equally deserving an

[1] *Bu'te-o lin-e-a'tus.* Average length of male, 18 inches; female, 20 inches.

[2] *Ac-cip'i-ter vel'ox.* Average length of male, 10.50 inches; female, 13 inches.

[3] *Ac-cip'i-ter coöperii.* Average length of male, 15.50 inches; female, 19 inches.

early and violent death. By a strange coincidence, it bears a strong resemblance to the sharp-shinned hawk, both in form and color, but it is a much larger bird. Leaving size out of consideration, it is difficult to describe in words the slight differences that exist between the two.

Being a bird of strong and rapid flight, much strength and activity, and great boldness, it is well equipped for raiding poultry-yards, and carrying off almost anything except geese and turkeys. Of 133 stomachs examined by Dr. Fisher, 34 contained poultry or game-birds; 52, other birds; 11, mammals; 1, a frog; 3, lizards; 2, insects, and 39 were empty. The game-birds found were 1 ruffed grouse, 8 quails and 5 pigeons. Altogether, 21 species of useful birds had been eaten, but only 4 mice, 1 rat and 1 grasshopper.

No record could be much blacker than this, and Cooper's Hawk is a pest whose career deserves to be ended by three drachms of powder and an ounce and a half of No. 6 shot, whenever opportunity offers. If gunners could *only discriminate*, the killing off of this species would make great sport for them; but the trouble is, many innocent birds would be killed by mistake.

This bird inhabits the whole United States, but stops at the Canadian boundary, and goes south to southern Mexico.

The American Goshawk[1] is to Canada and Alaska what Cooper's hawk is to the United States,—a wholesale destroyer of game-birds, serving no useful purpose whatever. To the unprotected flocks of ptarmigan it is a genuine scourge, and it merits destruction. Fortunately this hawk visits the United States only in winter, and even then is by no means numerous. Those who have had opportunities to observe it in action consider it the boldest and most audacious hawk in America. It has been known to seize a freshly killed chicken from the side of the farmer who had slain it for dinner, and also to follow a hen into a house, and seize it in the presence of its owner. (Fisher.)

The length of the Goshawk is from 21 to 25 inches. The top of its head is black, and its upper surface is bluish-slate color. Its whole under surface is white, with many gray cross-bars, in addition to which it is lined up and down with short, black lines, rather far apart. The lower tail surface is crossed by four gray bands.

[1] *Ac-cip'i-ter at-ri-cap'il-lus.*

The Marsh-Hawk[2] is essentially a prairie-hawk; and in the open and fertile uplands of the Mississippi valley, it is one of the most conspicuous species. It loves farming regions wherein members of the Mouse Family are plentiful and cheap. In hunting it flies low, in a very business-like way, just above the grain or tall grass, and its intentions are so apparent that the American farmer gave it credit for its good work, years before the true value of the once-despised "Hen-Hawk" became known.

This hawk is not beautiful, either in form, color or movement. To me it always seems to have too much sail area for the size of its hull. Its adult color is drab, or bluish-gray, but the

COOPER'S HAWK.

females and immature males are rusty brown, much like the red-shouldered hawk. However, this hawk can always be distinguished by the *large white patch on the rump*, just above the tail.

One of the first facts about the nesting of hawks that comes to a Western farmer boy by personal

[2] *Cir'cus hud-son'i-us.* Average length, about 22 inches.

observation is that the Marsh-Hawk nests on the ground, preferably in tall grass, in a nest that is anything but a workmanlike affair. When I found my first nest of this bird,—a patch of trampled grass in the head of a slough, with four big, downy nestlings wallowing around upon it,—the Marsh-Hawk fell several points in my estimation.

This species ranges all the way from Alaska, Hudson's Bay and Ontario to Panama and Cuba. Regarding its value, Dr. Fisher has this to say:

"The Marsh-Hawk is unquestionably one of the most beneficial as it is one of our most abundant hawks, and its presence and increase should be encouraged in every way possible, not only

SWALLOW-TAILED KITE.

by protecting it by law, but by disseminating a knowledge of the benefits it confers. It is probably the most active and determined foe of meadow-mice and ground-squirrels, destroying greater numbers of these pests than any other species, and this fact alone should entitle it to protection, even if it destroyed no other injurious animals."

One hundred and twenty-four specimens of this species were examined, and the stomachs revealed the following contents. 57, mice; 27, other mammals; 34, birds; 14, insects; 7, poultry or game-birds; 7, reptiles; 2, frogs; 1, unknown and 8 were empty.

The Swallow-Tailed Kite,[1] or, as the boys of the prairies call it, the **Forked-Tailed "Hawk,"** is in flight the most graceful bird I ever saw on the wing. No matter whether the sky be blue or gray, the snow-white head, neck and body, and glossy black tail and wings are sharply outlined in the heavens, drawing attention as a magnet draws nails. The bird is instantly identified by its long and deeply V-shaped tail, and its striking colors, which divide evenly between themselves the under surface of the wing.

In the golden days of boyhood, I saw scores of these birds in Iowa, but never saw one alight and perch, even for a moment. Several times we saw them with snakes in their talons, devouring them as they sailed through the air, and we also saw two or three seizures of prey. But it is the flight of this bird that makes the most lasting impression. In hunting and prospecting it never flies in a straight line, but always in graceful curves, and reverse curves, circles, parabolas, and spirals, like an expert skater "showing off." Its flight is indeed the poetry of motion in mid-air.

Unfortunately, this beautiful bird is not of wide distribution in the North, for its real home is in the tropics. In the United States it migrates northward in April into Iowa, Minnesota, Illinois, southern Michigan, and at rare intervals farther east and west to the Carolinas and the plains. So far as known, its food consists exclusively of small reptiles and large insects.

This bird fitly represents the whole group of Kites, of which the *White-Tailed Kite* is the Pacific coast species. The *Mississippi Kite* inhabits the Gulf states, and the *Everglade Kite* reaches our country only in Florida.

THE VULTURE FAMILY.

Cathartidae.

This Family ranks at the bottom of the list of the birds of prey, because its members are less intelligent, less active and resourceful in obtaining their food, and less able to take care of themselves than the hawks and owls. Although

[1] *El-a-noi'des for-fi-ca'tus.* Average length, about 23 inches.

not so highly developed as the hawks, the vultures serve a most useful purpose in the economy of Nature, and exhibit some traits that are really wonderful. The broad-minded student will not turn from these birds with aversion merely because their heads are bare, and they feed on dead food. Their heads are naked for professional reasons.

Two things about vultures are particularly striking. One is the enormous heights to which they soar, the other is their marvellous quickness in discovering the body of a dead animal. Many times, in clear summer weather, I have seen the **Common Turkey Vulture**[1] sailing and circling on wide-spread but motionless pinions, so high in the heavens that its distance from the earth seemed to be two miles or more.

Clearly, these aërial promenades, often continued until the observer is weary of watching them, are taken for pleasure. One great circle succeeds another in a series that seems unending, but all the while the wings are as motionless as if wired in position. On such occasions, even a homely and unlovely Buzzard can become

Photographed by E. F. Keller. National Zoological Park.
CALIFORNIA VULTURE.

[1] *Ca-thar'tes au'ra.* Average length, about 29 inches.

an object of admiration, and a reminder of William Tell's Alpine eagle, which—for sentimental reasons, only—he "could not shoot."

"His broad, expanded wings
Lay calm and motionless upon the air,
As if he floated there without their aid,
By the sole act of his unlorded will,
That buoyed him proudly up."

The flight of the Vulture, by which it gains enormous heights without any serious exertion after getting well clear of the earth, is an interesting illustration of what a perfect aëodrome might accomplish if it could flap its wings for a lofty rise, sail with abundant wing-power, and be intelligently guided. Beyond doubt, the bird keeps aloft by properly utilizing the lifting power of air-currents.

By a strange coincidence, the bird which flies highest and longest, and soars most majestically, is also the bird of lowest tastes on the earth. Although it has strong talons and a strong beak, it kills nothing, and feeds upon dead animals. In every country on earth, vultures are treated as highly useful creatures. In the tropics, where their services really are of great value, they are fully protected by law.

The species found farthest north, with a bright-red head and neck, is the Turkey Vulture, and it ranges across the continent from the plains of the Saskatchewan to Patagonia.

The Black Vulture,[1] marked by a head and plumage which is perfectly black, is seldom seen in the northern portions of the United States, but is abundant in the Gulf states, and southward far down into South America. In appearance this bird is most funereal. It is a smaller bird than the turkey vulture, but does not fly so well, and flaps its wings oftener. Around the cities of the South it is a great domestic economist and labor-saver.

In Bombay, India, the Parsees expose their dead in two great, shallow, open-topped towers, called the Towers of Silence, and the vultures regularly devour them,—all except the bones, which fall down into a central pit.

The California Vulture, or **California "Condor,"**[2] is, among naturalists, the most celebrated bird of this Family, partly because it is our largest bird of prey, and also because of its great rarity. The "collectors" are certain to exterminate it in a very few years. Its appearance depends upon its attitude. With its wings spread, it is a grand bird; but with them closed its personality is far less impressive. On the wing, in the wild, rocky fastnesses of its native mountains, those who have seen it there say it is a grand and imposing object, and it is not to be wondered at that its pursuit is quite as exciting as the chase of the big-horn.

E. F. Keller, Photo., National Zoological Park.

YOUNG CALIFORNIA VULTURE.

Mrs. Florence Merriam Bailey[3] gives the following as the dimensions of this bird: "Length, 44 to 55 inches; wing-spread, 8½ to nearly 11 feet; weight, 20 to 25 pounds. Distribution: coast ranges of southern California from Monterey Bay south to Lower California, and east to Arizona."

This great Vulture breeds in the most inaccessible crags it can find, but of course collectors find it. In 1894, Mr. Stephens actually encountered a flock of twenty-six of these magnificent

[1] *Cath-ar-is'ta ur'u-bu.* Average length, about 25 inches.

[2] *Gym'no-gyps californianus.*

[3] "Handbook of Birds of the Western United States," p. 144.

Photo. by E. R. Sanborn, N. Y. Zoological Park.

THE CONDOR.

birds. For three years, a very fine specimen has lived in the National Zoological Park, at Washington, shut up at night in an elevated sleeping-box. In the morning when liberated in its enclosure, it perches aloft, spreads its wings and holds them out to catch the sun's rays, in true vulture fashion.

Largest of all the Birds of Prey is the **Condor**[1] of the Andes, a bird of lofty home but lowly habits. In the Andes of Chili and Peru, its range is from 9,000 to 16,000 feet above the sea, and it not only feeds upon dead guanacos and vicunias, horses and other domestic animals, but it also ventures to attack living calves and old horses that are almost incapable of defence. Condors are so easily captured alive that the zoological gardens of the world are always well stocked with them.

By nature the Condor is a peace-loving bird, and for two years visitors to the New York Zoological Park have witnessed the strange spectacle of the world's largest bird of prey—the fine adult male shown in the accompanying plate—living in the great Flying Cage in peace and harmony with about eighty flamingoes, herons, egrets, ibises, ducks, other water-birds and various land-birds. Encouraged by the success of the Condor experiment, a large griffon vulture has been added to the "happy family," with very satisfactory results.

[1] *Sar-co-rham'pus gry'phus.* Length of male, 48 inches; spread of wings, 8½ to 9½ feet.

CHAPTER XXII

THE ORDER OF PIGEONS AND DOVES

COLUMBAE

The Passenger Pigeon[1] was until very recently only a bird of history; and, until 1899, it was regarded as a species practically extinct. The men who lived in the Mississippi Valley forty years ago remember the flocks that flew swiftly over the farms, sometimes fifty and sometimes two hundred or more birds together. It was a wonderful sight to see the perfect mechanical precision with which they kept together, wheeling and circling in as perfect formation as the slats of a Venetian blind.

This very rare bird is much larger than a dove. Its color is bluish above, and reddish-brown underneath, and the feathers of its neck have a rich metallic lustre. Its tail is *long and pointed*, and its feet and legs are red. It never was found in the far West, and never will be. The pigeon of the Pacific coast is a totally different species.

In the early days, Ohio seemed to be the centre of abundance of this bird, and the accounts that have been written of that period relate how the Pigeons sat so thickly upon the trees that branches were broken by their weight; how they covered the earth when they alighted in the fields to feed, and darkened the sky when they flew.

As usual, that great abundance of wild life provoked great slaughter. Migrating Pigeons were killed by wholesale methods. While breeding they were attacked in their nesting-places, and in an incredibly short time the great flocks vanished. As in the case of the blotting out of the great northern buffalo-herd, in 1884, many persons have wondered, and do still, whether the great flocks of Pigeons have not migrated, and found a permanent home elsewhere. There is not a single fact on which to base either belief or supposition that the Passenger Pigeon exists abundantly in Mexico, Central America or elsewhere.

Among naturalists, the blotting out of this interesting species has been a source of sincere regret. As usual, no one thought of protecting it until it was entirely too late. But it seems as if we are to be given another opportunity to count this bird in our avifauna. Beginning about 1891, a few small flocks began to appear in the United States, first four or five birds together, and then larger flocks. Mr. George O. Shields, Editor of *Recreation* Magazine, has carefully sought out and published the details of every Pigeon occurrence that came to his knowledge. Up to January, 1901, the following observations of the occurrence of Passenger Pigeons were reported in the magazine mentioned above:

Wisconsin, Milton	1891 to '99	Several annually		*Recreation*,	Sept., 1899.
Canada, Ft. QuAppelle	July, 1898	A flock		"	Dec., 1898.
Illinois, Edinburg	"	3 birds		"	May, 1899.
Kentucky, Caldwell Co.	Oct., "	30 "		"	Feb., "
Michigan, Ann Arbor	Oct., "	200 "		"	Apr., "
Wisconsin, Lime Ridge	April, 1899	100 "		"	July, "
Indiana, Sullivan	May, "	25 "		"	" "
Ohio, Litchfield	April, "	150 "		"	June, "
Wisconsin, Amherst	" "	100 "		"	Aug., "
Illinois, Chadwick	Oct., "	50 "		"	Sept., "
Wisconsin, Milwaukee	" "	17 "		"	" "
" Norway	May, "	200 "		"	" "
Manitoba, Southern	"	A few "		"	Jan., 1900.
New York, Willsville	Sept., "	10 "		"	" "
Canada, Three Rivers	Dec., 1899	1 bird		"	" "
New York, Willowemoc	Nov., "	200 birds		"	Feb., "
Minnesota, Dumont	July, "	45 "		"	" "
Michigan, Lowell	1900	40 "		"	Dec., "

[1] *Ec-to-pis'tes mi-gra-to'ri-us.* Average length, about 16 inches.

The hopes entertained in 1903 that some of the rumors of the existence of living Passenger Pigeons might be true, and that a come-back might be possible, all proved vain. Although such hopes lived until 1915, and a few faint ones do to-day, they are utterly without foundation. So far as history can show, the last living Passenger Pigeon died in captivity, in the Cin-

THE BAND-TAILED PIGEON.

cinnati Zoological Garden, on September 1, 1914, at the age of twenty-two years.

The Passenger Pigeon once existed in countless millions, and man foolishly thought that those millions never could be exterminated. As usual in such cases, total extinction quickly followed.

The Band-Tailed Pigeon,[1] of the Pacific states from British Columbia to Guatemala, and eastward to the Rocky Mountains, yet exists in fair abundance, and it is earnestly hoped that it never will be annihilated without reason or mercy, as was the sad fate of its eastern relative. Wherever found it should be accorded legal protection, without delay.

This fine bird is conspicuously marked by a white collar around its neck, and *a square-ended tail which terminates with a dull-white band from one to two inches wide.* The head and under parts are purplish-pink, fading downward to a lighter color. The back is brownish-gray, fading out toward the tail into a dull-blue tone.

This Pigeon subsists upon acorns, seeds and berries, and attracts attention to itself by its noisy flight. Its strange vocal utterances are graphically described by Mrs. Florence Merriam Bailey:

"If you follow the pigeons to their breeding-grounds in some remote canyon you will be struck by the owl-like hooting that fills the place, and you will locate the sound here and there along the sides of the canyon at dead tree-tops, in each of which a solitary male is sunning himself, at intervals puffing out his breast and hooting. The hooting varies considerably. Sometimes it is a calm *whoo'-hoo-hoo, whoo'-hoo-hoo,* at others a spirited *hoop-ah-whoo',* and again a two-syllabled *whoo'-ugh,* made up of a short, hard hoot and a long coo, as if the breath was sharply expelled for the first note and drawn in for the second." ("Handbook," p. 139.)

To me the **Mourning-Dove**[2] has always seemed like a sacred bird; and although I could have killed thousands, I never took the life of one. When a very small boy at my mother's knee, she related to me the story of the winged messenger which Noah sent out of the ark, over the waste of waters, to look for real estate. She told me that Doves were innocent and harmless little birds, and that I must never harm one in the least. Had my good mother issued an injunction covering the whole animal kingdom, I think I would have grown up as harmless to animals as any Hindoo; for her solemn charge regarding Doves has always seemed as binding as one of the ten commandments.

I mention this in order to point out to mothers the far-reaching extent of their power in behalf of our wild creatures, and the vast influence which they can easily wield in behalf of birds and mammals in sore need of protection. Is it not a good thing to teach all boys that it is mor-

[1] *Co-lum'ba fas-ci-a'ta.* Average length, 15 inches.

[2] *Ze-na-i-du'ra ma-crou'ra.* Average length, 12 inches.

MOURNING-DOVE.

ally wrong (*which it is!*) to kill wild creatures without reason, mercy and common-sense?

The Mourning-Dove received its "given" name from the mournful sound of its call-notes. Its sad-voiced "*Coo, coo, coo,*" suggests moaning, and, next to the awful, storm-beaten wail of the screech-owl, it is, under certain conditions, the most doleful sound uttered by an American bird. I knew one sensitive woman who was so affected by the daily "mourning" of a neighboring Dove that she begged a sportsman to frighten it away.

Another peculiar fact about this bird is the strange musical note that is sounded by the vibration of its wings. As the bird springs from the ground in flight, or wings its way overhead, the pulsations of its wings give forth a ringing, metallic sound, like the twanging of a tight wire.

This Dove loves country roads, more than any other bird, and to those who love beautiful things, its exquisitely moulded form and immaculate plumage is always a pleasing touch of Nature. One might as well try to describe in words the colors in a fire opal as those of this bird. There is pink iridescence, and brownish, and grayish, and blackish, and other shades too numerous to mention, but the combination baffles description.

This Dove breeds throughout the United States from the international boundary to the Gulf, and migrates as far south as Panama. In California it is now counted as a "game-bird," and killed by sportsmen, and in the South also it is killed by the negroes for food. A great "game-bird" this, truly! A genuine sportsman must be very hard pressed for gun victims when he can seriously call this tamest of all birds "game." And can any farmer in his senses *afford the expense* of having Doves shot on his farm, or in his neighborhood? Let us see.

When the Biological Survey of the Department of Agriculture took up the case of the Mourning-Dove, and examined the stomachs of 237 specimens, the summary of results proved that as a weed-destroyer this bird is one of the most valuable in North America. Weed-seeds constitute 64 per cent of its food, all the year round, with little monthly variations. In order to arrive at an exact determination, the seeds in three stomachs were carefully identified and counted. One contained the following:

Orange hawkweed (*Hieracium aurantiacum*)	4,820 seeds.
Slender paspalum (*Paspalum setaceum*)	2,600 "
Hoary vervain (*Verbena stricta*)	950 "
Panicum	620 "
Carolina cranesbill (*Geranium carolinianum*)	120 "
Yellow wood-sorrel (*Oxalis stricta*)	50 "
Miscellaneous weeds	40 "
	9,200

The second specimen of the three contained 6,400 seeds of the farmers' ancient and persistent enemy, fox-tail (*Chactocloa*), while the third turned out 7,500 seeds of the yellow wood-sorrel. The grand total of weed-seeds for those three Doves was 23,100! And this for only one day's supply. Assuming that those three Doves had been killed as "game" by some "sportsman (!)," previous to their meal, and those seeds had produced 23,100 weeds, how much would it have cost in labor at $1.50 per day to destroy them?

Besides the 64 per cent of weed-seeds in the 237 stomachs, there was found 32 per cent of grain, but of this three-fourths was waste grain, gleaned in the fields after harvest.

Whoever does aught for the protection of Doves, does well; and a word to the wise is sufficient.

CHAPTER XXIII

THE ORDER OF UPLAND GAME-BIRDS

GALLINAE

It is natural that a country possessing the wide diversity of uplands that exists in the United States should possess a great variety of ground-dwelling birds. In response to the inviting fields and forests, plains and mountains, —cold and warm, wet and dry,—the birds of the Order Gallinae originally were very numerous, and very widely distributed.

It is no wonder that men and boys like to hunt upland game-birds; *and when the conditions are properly observed,* it is right that they should do so. But conditions now have enormously changed. All these fine birds are on the brink of the precipice that drops into oblivion. Do not help to push them over. *Stop hunting them* and give them a fighting chance to recover. Their paltry ounces of meat no longer are necessary in these well-fed United States as "food" for the hungry. It is the well-fed men who are exterminating these birds!

During the twenty years ending in 1927, the upland game-birds of the United States have been savagely pursued and destroyed by the millions of hunters who each year go after them. Nothing that "the law allows" and the guns can reach is spared. The result is wide local extinction,—of both game and sport! For example: In 14 of the 35 home states of the bob-white quail, quail hunting has been stopped. In 14 states all turkey hunting, in 7 states all sage grouse shooting, in 6 states all ruffed grouse shooting, and in 9 states all prairie chicken hunting has been stopped,—because the birds are gone.

The trouble is that the upland game-birds are so easily pursued and killed that they are most easily exterminated; and no one seems to pay the slightest heed to their value to farmers, in the destruction of insects and weed seeds.

Some upland game-birds can be brought back by long close seasons,—but if hunted too long, and desperately weakened, *they cannot recover!* The case of the heath hen (eastern prairie chicken) conclusively proves the truth of this, and if a long-protected species has recovered somewhat, for heaven's sake do not be so *merciless* as to at once rush forward with a demand for "a short open season,"—as some men do!

The table below affords a bird's-eye view of this Order as it exists north of Mexico:

ORDER GALLINAE, North of Mexico.	FAMILIES.	GROUPS.	EXAMPLES.	
	Grouse Family: . . . *TET-RA-ON'I-DAE.*	**Quail and Partridges:** . .	Virginia "Quail," or Bob-White.	
			California Mountain "Quail."	
			California Valley "Quail."	
			Mearns' Partridge.	
			Scaled Partridge.	
		Grouse:	Ruffed Grouse.	
			Canada Grouse.	
			Pinnated Grouse.	
			Sharp-Tailed Grouse.	
			Sage-Grouse.	
		Ptarmigan:	Willow Ptarmigan.	
	Pheasant Family: . . *PHAS-I-AN'I-DAE.*	**Turkeys:**	Wild-Turkey.	
		Pheasants: . . . . . All of the Old World only.	Ring-Necked Pheasant.	Introduced.
			Golden Pheasant.	Introduced.
			Silver Pheasant.	Introduced.

BOB-WHITE.

As the preceding diagram shows, there are no true pheasants in America save those that have been introduced from China and Japan. All the birds to which that name correctly applies inhabit the Old World.

THE GROUSE FAMILY.

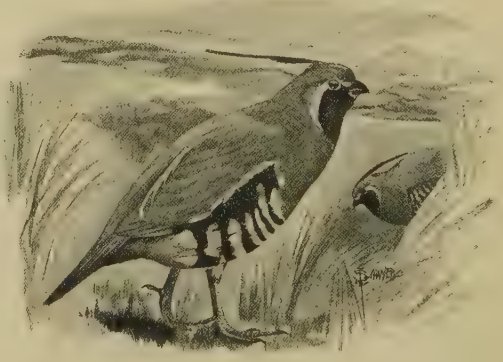
Tetraonidae.

Our dear old friend the **Common "Quail"** is now called **Bob-White** [1] in all the modern bird-books, but to about fifty million Americans it is yet, and ever will be, *the* Quail. It is our longest-known and most widely known American game-bird, and it is almost wholly a United States bird. It is at home from Maine and Florida to Texas, the western border of Oklahoma and South Dakota. In very many eastern localities, however, it has been almost exterminated by excessive shooting, and during the past ten years many thousands of Mexican Bob-White have been imported to areas of quail extermination in about ten of our states, but usually with no permanent results. The extermination of desirable species always costs money.

The call of this bird is one of the most cheerful sounds in nature, and for carrying qualities it is far-reaching. From the heart of a hazel thicket one hears his loud, shrill whistle, saying "CLERK-*it!* CLERK-*it!* CLERK-*it!*" until everything rings again. On the hurricane deck of a high stump, or the top rail of a fence, he poises himself, points his bill at the sky, swells out his white throat and whistles long and loud, "Bob! BOB! WHI-EET!" But the feathered rascal knows very well when the close season is on; and when the "law is off" he sings very small.

That many men enjoy Quail shooting is no cause for wonder or reproach. The birds lie close in the edge of the brush until the dogs are ready to tread upon them, when "*Burr-r-r-r!*" the covey explodes in the air like a bomb, the gray and brown fragments fly in half a dozen directions, and the young sportsman is so "rattled" he is almost sure to miss. A well-scared Quail is no easy mark.

Quail are rapid breeders, and in protected localities they increase rapidly. A good bird-law in Kansas has resulted in bringing back the vanished flocks, to a surprising extent. Unfortunately, however, it is not possible to breed Quail in large numbers in confinement, even with a quarter section of land for the experiment.



CALIFORNIA MOUNTAIN PARTRIDGE.

The flesh of this bird is a great table delicacy,—provided it has not been kept in cold storage. A cold-storage Quail is as good to the taste as a chunk of pressed sawdust, but no better; and

[1] *Co-li'nus virginianus.* Average length, 10 inches.

as human food an eminent New York physician, Dr. Robert T. Morris, pronounces it unwholesome and dangerous. In flavor, cold-storage Quail is far inferior to fresh chicken or turkey. In a court of law, a cooked Quail can easily be identified from squab, reed-bird, "rail-bird" and many others by the fact that the meat on its breast is *white*, while all the others wear dark meat.

The California Mountain "Quail," or Mountain Partridge,[1] is a bird of most pleasing appearance, which inhabits California, Oregon and Washington. Wherever protected it is spreading rapidly in the settled portions of the Northwest. It loves moist regions, wherein the rainfall is abundant. This is the bird with a black throat, a white crescent running down from the eye, two rows of white markings on each side, and a long, *drooping* plume on its head running back on the same curve as the forehead. This bird goes in small flocks, of ten to twenty, hides well, and is not easily flushed without a dog.

The Valley "Quail," or Valley Partridge,[2] is the bird of the Pacific coast which has the very jaunty, *erect* black plume, rising from the top of its head and gracefully curving forward. Its color markings are rich and beautiful, but not gaudy, and in form as well as color, it is very handsome. In fact, it is the most beautiful of all our small upland game-birds. It inhabits Oregon, Nevada, the whole of California and the Lower California peninsula, and in some places ascends the mountains to 9,000 feet. It has been acclimatized in Utah, and there are many other localities in which it might well be introduced.

This partridge is the most widely distributed and frequently seen game-bird in California, not only in the mountains, but also in the cultivated valleys, everywhere, and even in Golden Gate Park, San Francisco. It breeds readily in confinement in the New York Zoological Park, and when safe from rats is not difficult to keep.

The Mearns' Partridge,[3] of Mexico, western Texas and southern New Mexico and Arizona, must be mentioned because it is too odd and striking in appearance to be ignored. It may be known by the numerous large white spots on the sides of its body just below the wings, and its harlequin head of black and white bars and collars. It is of great interest to Americans residing in Mexico, and many attempts have been made to acclimatize it in captivity in the United States. I once had in my possession two of these birds whose white spots had been artificially changed by some enterprising Mexican to a beautiful golden-yellow color. Until the trick was discovered, the birds were quite a puzzle, for the

CALIFORNIA VALLEY PARTRIDGE.

fact that they had been dyed was not proven until they moulted.

The Ruffed Grouse[4] is the dandy of American game-birds. In various places it is called by various names, some of which are mischievously confusing. By many persons it is called a **"Pheasant,"** and by others a **"Partridge";** but both these names are entirely incorrect, and when applied to this bird create confusion. Often it is impossible to converse understandingly about this bird without first defining boundaries, and coming to an agreement regarding the names "Pheasant" and "Partridge." Now that a real pheasant (the ring-necked) has been introduced from China into many portions of the United States, it is all the more imperative that

[1] *Or-e-or'tyx pic'tus.* Average length, 11 inches.
[2] *Lo-phor'tyx californicus.* Average length, 9 inches.
[3] *Cyr-to'nyx mon-te-zu'mae mearnsi.* Average length, 8.50 inches.
[4] *Bo-na'sa um-bel'lus.* Average length, 16 inches.

the Ruffed Grouse should be called by that name, *and no other!* It is called "Ruffed" because of the ruff of feathers that it wears just in front of its shoulders, and under the name "Redruff" this bird has been most charmingly introduced by Mr. Ernest Thompson Seton to many thousand readers who never had known it previously.

This Grouse is in every respect a forest-bird. Its ideal home is mixed forest of hardwood and coniferous trees, with the white-tailed deer and

EASTERN RUFFED GROUSE.

gray squirrel for company. Its home extends from Massachusetts and northern New York to northern Georgia, and westward very sparingly beyond the Mississippi to the Dakotas. Besides being beautiful, it is a bird of interesting habits, and its flesh is entirely too fine for its own good. In size it is smaller than the pinnated grouse, or prairie-chicken, but in intelligence it is second to no other grouse living.

The prevailing color of the Ruffed Grouse is rusty brown, but the mottlings of black, gray and white defy intelligent description. Open or shut, the tail is a dream—cross-barred, banded and mottled most exquisitely. It is no wonder that the male bird is fond of strutting, with spread tail; but besides this it has a still more effective means of attracting the female. It perches on a log, secures a good grip with its feet, then *beats the air* with its wings until you hear at the end of the performance a long, quivering resonance disturbing the solitude, like beating upon a Hindoo tom-tom.

The beats start slowly, but quickly increase in rapidity to the end, thus: "*Dum!-dum!-dum!-dum-dum-dumdumdumdum.*" The bird does not beat the log, and it does not beat its own sides. Thoreau declares that its wings strike together behind its back! This "drumming" of the Ruffed Grouse is heard oftenest in spring, and is a signal to the female; but it is also heard occasionally in summer and autumn.

This Grouse is a strong flier, and gets up before the hunter with such a tremendous "*burr-r-r-r*" of wings, and goes off so explosively, that it takes a quick eye and hand to bring it down. It can dash off through timber like a feathered rocket, dodging trees and branches, and zigzaging in all directions leading away from danger, with a degree of speed and certainty that is really marvellous. No wonder the young hunter who kills one, fairly and squarely, feels proud of his skill, and hastens away to have the trophy mounted for his den.

Unfortunately, in most eastern states, where the Ruffed Grouse should hold its own for a hundred years, this bird is doomed to complete extinction. In addition to its relentless pursuit, even when the daily bag is limited to two birds, it is now being persistently attacked by deadly parasites of several kinds, and by more diseases than have yet been described. In the present year (1927) these grouse diseases are being carefully studied by a corps of trained investigators, —but even if the sources of the deadly enemies of the grouse are uncovered, how can such wild and wary birds be given medical treatment? How can their habits and environment be changed in the least?

The following subspecies, closely related to the typical Ruffed Grouse, are found in North America:

The Oregon, or *Sabine's Grouse*, is found on the mountains of the Pacific coast, west of the Coast Range, from northern British Columbia to California. This species possesses rich red plumage, and is quite beautiful.

The Canadian Ruffed Grouse belongs to Canada and Maine, but in the Northwest it ranges south of the international boundary. The *Gray Ruffed Grouse* inhabits the Rocky Mountains from the Yukon to Colorado.

The Dusky Grouse[1] is a conspicuous type which inhabits the Rocky Mountains from Idaho and Montana to Arizona. Its other

[1] *Den-drag'a-pus ob-scu'rus.* Average length of male, about 21 inches; female, 18 inches.

with me to the country roads, and listen for three minutes to the delicious melody that pours from the quivering throat of a **Song-Sparrow.**[1] When he feels well, he will perch on the top of a hedge, secure a good grip on a comfortable twig, point his beak skyward at an angle of sixty degrees, and sing as if trying to burst his little throat. Mrs. Mabel Osgood Wright justly calls him "the darling among the song-birds," and "the most constant singer among our northern birds.' In some localities, at least, they sing all summer long. In Iowa I have heard them a thousand times, bravely piping and trilling in the sweltering heat of July and August, when other birds were silent, and have been moved to wonder at the amount of energy stored up in their little bodies.

I think the best way to identify this bird is by its singing. Pick out the sparrow in gray and brown which sings to surpass all others, and it will be a Song-Sparrow. Its home is the eastern half of North America, from northern Manitoba to Mexico. West of the Rocky Mountains it becomes the *Mountain Song-Sparrow.* In the southwestern deserts it grows pale,—to match its environment,—and becomes the *Desert Song-Sparrow.* There are thirteen species of the Song-Sparrow genus,—or at least that number have been described, and Alaska is yet to be heard from.

The White-Throated Sparrow[2] is the species which comes next in general attractiveness. It is a very pert and pretty bird—for a sparrow, and its oddly marked head is easily identified. It wears a white goatee and a black cap, and on the latter is laid a broad arrow, in white. A white line comes down along the centre line of the head, and another comes forward over each eye, until the three come together at the base of the upper mandible. The song of this bird is pleasing, and nearly every self-respecting ornithologist translates it into English to suit his or her fancy; but, to tell the truth, the White-Throat never will win a prize as a great singer.

The English Sparrow.[3]—Let me dip my pen in blue vitriol; for my temperature rises at the thought of writing the name. Daily we see the unclean little wretches grubbing in the filth and microbes of the street, where no American bird will humble itself to feed. After twenty years of acquaintance, I am obliged to say that I never saw one catch a worm, a caterpillar, or an insect of any kind. When the elm-trees are loaded with tent caterpillars, an English Sparrow will let them crawl all over him, and not kill one. Instead of ranging out into the open fields and hunting for clean weed-seeds, this bird revels in the foulest dirt of the street. It does, however, manage to eat the seeds of the dandelion, when the heads are filling, in April and May.

WHITE-THROATED SPARROW.

The English Sparrow is not beautiful, either in form or plumage, and it cannot sing a note. Its tastes are low and vulgar. It is quarrelsome, and crowds out many other species of small perching-birds. In Cheyenne, Wyoming, when Mr. Frank Bond killed all the English Sparrows, and kept them killed, other perching-birds flocked into the city in great numbers, and many species bred there. The more persistently these

[1] *Mel-o-spi'za fas-ci-a'ta.* Length, 6½ inches.
[2] *Zo-no-tri'chi-a al-bi-col'lis.* Length, 6½ inches.
[3] *Pas'ser do-mes'ti-cus.* Length, about 6 inches.

interlopers are killed off, the better for all other birds. They can be made to serve well as subjects for dissection in the school-room, and for amateur taxidermists; and they make excellent food for captive hawks, owls, small carnivores, and live snakes of several species.

The introduction of this bird may well serve as a solemn warning against any further meddlings with Nature on that line. In the first place, there never existed the slightest reason

CARDINAL.

or need for this importation. Without serious consideration, or consultation with the persons most competent to advise, this bird was imported and planted in twelve widely separated localities in the United States. To-day it is a feathered nuisance that spreads over one-half the United States, and excepting locally cannot be abated. Nevertheless, it is within the power of western towns and cities wherein it has not yet gained a foothold to follow the example of Mr. Bond in Cheyenne, and destroy every colony that enters before it has time to breed.

The Cardinal, or **Cardinal Grosbeak,**[1] also called the **Cardinal Redbird,** is the pride of the South. From New Orleans to New York it is persistently trapped and "limed,"—not to "keep" as a cage-bird, but to *sell* as such. Poor, unhappy Cardinal! How much better its fate had it been created black instead of bright cardinal red, with no jaunty top-knot, and no fatal gift of song!

In a cage 6 by 9 feet, or even 4 by 4, a bird like this flies to and fro, and in company with a dozen other small birds finds life far from dull. But if you put a wild song-bird in a cage barely large enough for a canary, the bird is wretched, it dies soon, and the keeping of it is a sin against Nature. Excepting canaries and a very few other species, if you cannot keep birds (and mammals, also) in big cages, *do not keep them at all!* The way thousands of song-birds are caught in some portions of the South, to sell as cage-birds, is a sin and a shame. At this date, New Orleans in particular has before her an imperative duty in breaking up this business. Children everywhere should be taught that it is *almost impossible for any one save an expert bird-man to take young song-birds, and rear them successfully.* Young insectivorous birds require specially compounded bird-food, and it must be given to them *every hour*, with small forceps—a very tedious operation.

In the kindness of their little hearts, children often take young song-birds from the nest, cage them, and try to feed them on what some little folks like best—cake and cream! They might as well give them poison! For any one ignorant of the precise methods necessary in rearing insectivorous birds, to take such birds from their parents is *cruelty and destruction!*

The sight of a wild Cardinal always compels attention. The bird is not only beautiful in color, but it is aristocratic in form and manner. It comes up from the South into New York state, and the Ohio River region, and extends westward to the edge of the plains region.

The Rose-Breasted Grosbeak[2] is, in all respects save one, a very beautiful bird. It has a big, clumsy-looking, conspicuously white beak, which almost spoils the whole bird. But the pink-sunset flush on the clear sky of its breast, its glossy-black head and tail, and black-and-white wings, are so beautiful a combination they lead one to forgive the homely beak. The delicate pink-rose tint on the breast renders the identification of this bird very easy, even at first sight.

I must confess that I remember nothing of

[1] *Car-di-nal'is car-di-nal'is.* Length, 8.50 inches.

[2] *Zam-e-lo'di-a lu-do-vi-ci-an'a.* Length, 8 inches.

the Grosbeak's song, and that it made no impression on me, even when these birds were around me. Certainly it is no great singer, not more than third-rate, at the best, or its song would be more in evidence. It is celebrated as an enemy of the potato-bug, and it feeds omnivorously upon other insects, buds, blossoms, seeds and fruit.

ROSE-BREASTED GROSBEAK.

The range of this species is bounded by the great Rocky Mountain barrier. Westward thereof is found the *Black-Headed Grosbeak*, and the arid lands of Texas, Arizona and southern California are inhabited by the *Western Blue Grosbeak*.

The bluest bird that flies in North America is the **Indigo Bunting,**[1] a trim little craft, built and rigged like a warbler, and of warbler size. Like the ocean, it is

"Deeply, darkly, beautifully blue,"

—not the sky-blue of the jay, but like indigo. In the East you cannot possibly mistake it. The deep-blue bird of the Far West is the *Lazuli Bunting*, our bird's nearest relative.

[1] *Cy-a'no-spi-za cy-a'ne-a.* Length, 5.50 inches.

THE BLACKBIRD FAMILY.

Icteridae.

This Family includes several showy species of birds which are very much in evidence, and quite generally known to country dwellers. Five representative and very interesting species will be noticed.

The Bobolink[2] is a bird with two very distinct characters. It has a name and a suit of feathers for the North, another suit and another name in the South; and it has three reputations.

When in springtime a certain jolly and vigorous little song-bird comes up from the South, he puts on a dress-suit of marvellous design, in black, white, brown and gray, as shown on page 178. He is then a regular swell, and his name is Bobolink. His mate, however, is a plain little bird, clad in yellowish-brown, with slight trimmings of yellow and white. They frequent the marshes and low meadows, nest on the ground, and rear from five to seven young.

That accomplished, the male bird doffs his pretty spring suit, acquires plumage like that of the female, and then they go South. There they become **Rice-Birds,** and they raid the rice-fields of the southern states until they grow quite fat. Next, enters the Man-With-a-Gun; and the birds fall easy victims. The birds are shot for two reasons: The rice-planters find them a nuisance in their fields, and many people think Rice-Birds are good eating.

Consider the **"Reed-Bird** on toast," or, worse still, "on a skewer." It is a trifle too large for one mouthful, but by no means large enough for two. A healthy, able-bodied American at work upon this two-ounce bird with a ten-inch knife is a sad but impressive spectacle. It is to be hoped that it will be long ere the people of this country really have cause to turn to this tiny song-bird—*or any other song-bird*—as a source of food with which to satisfy hunger. How can any self-respecting man deliberately order so pusillanimous a dish as "Reed-Birds on a skewer?" There is a land so populous and poor that its people eat sparrows because they need them for food; but it is far from America.

The Bobolink is really a very acceptable singer,

[2] *Dol-i-cho'nyx o-ry-ziv'o-rus.* Length, 6.75 inches.

RED-WINGED BLACKBIRD.

and has furnished a theme for several poets, of whom Bryant was the most celebrated.

The Red-Winged Blackbird [1] is a bird that delights my soul. No marsh or cat-tail swamp is complete without him. No spring ever can be perfect without his sweet, liquid gurgle—"O-ka-leé." You hear that flute-like call when the sky is clear, the warm sunshine is flooding field and stream, and you are glad that you are alive.

The jet-black plumage of this bird, with epaulettes of scarlet and white, make a brave show among the dull green blades of the cat-tails. As a rule, bird-songs translated into English do not appeal to me very strongly; but the Red-Wing does say "O-ka-leé" to perfection!

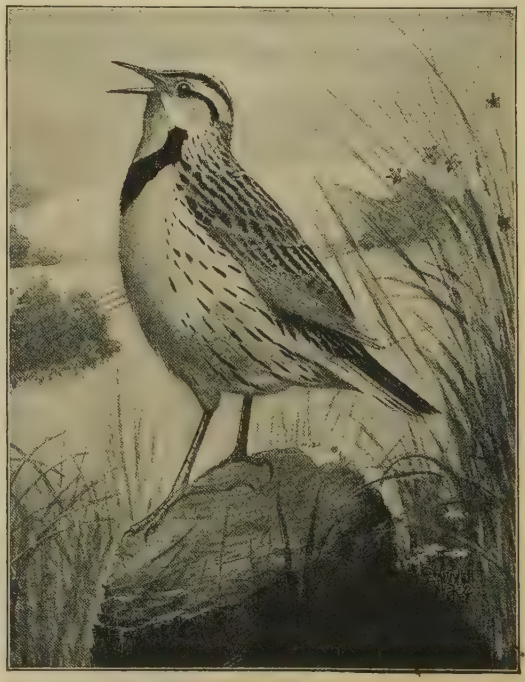
The typical Red-Wing is an eastern bird, but its half-dozen subspecies are so well dispersed throughout the United States that almost every region possesses one.

The Yellow-Headed Blackbird [2] is a very conspicuous species throughout the West, from Indiana almost to the Pacific. Its entire head, neck and breast are of a dull-yellow color, but elsewhere it is wholly black, save a white patch on the wing. In Montana it is very common in summer.

The Meadow-Lark [3] is one of the most trustful and sociable of our birds. As its name implies, it is partial to open grass-lands, and its favorite hunting-grounds are the bits of waste land in sloughs (called "*slews*" in the West), that are full of low weeds. This bird does not like tall grass or weeds, for it is very curious to know all that is going on in the world about it. It is an indifferent flyer,—slow and short,—and manifests a decided preference for the haunts of man.

The Lark contributes much to the pleasures of life on a farm. Its bright-yellow breast and throat, with a jet-black neck-scarf, are as cheerful as an April sunburst. The long, conical beak, rather long legs and erect carriage of this bird give him an air of cheerful confidence which says to you, "I'm a good fellow, and you're another!" His song is nothing to boast of, but he always pipes up cheerfully, and does the best he can. I always liked this bird, and count him as one of the dear friends of my boyhood. To me, his plumage is beautiful, especially when seen on a fresh, dewy morning, when the sun is newly risen, and the song-birds are greeting the new day.

According to the investigations of the Biological Survey, the Meadow-Lark is one of the most valuable of all birds that frequent farming re-



MEADOW-LARK.

[1] *Ag-e-lai'us phoe-ni'ci-us.* Length, 9 inches.

[2] With an apology to the reader, it is stated that the Latin name of this bird is *Xan-tho-ceph'a-lus xan-tho-ceph'a-lus:* and its length is about 9 inches.

[3] *Stur-nel'la mag'na.* Length, about 10 inches.

gions. Throughout the year, insects make up 73 per cent of its food, grain, 5 per cent, and weed-seeds, 12 per cent. During the insect season, insects constitute over 90 per cent of this bird's food supply. As a destroyer of insects and weeds, this bird is entitled to the most perfect protection that laws and public sentiment combined can afford.

In Montana, the **Western Meadow-Lark**[1] quite wearied me by the tiresome iteration, day after day, of its one short, seven-word song. This was it:

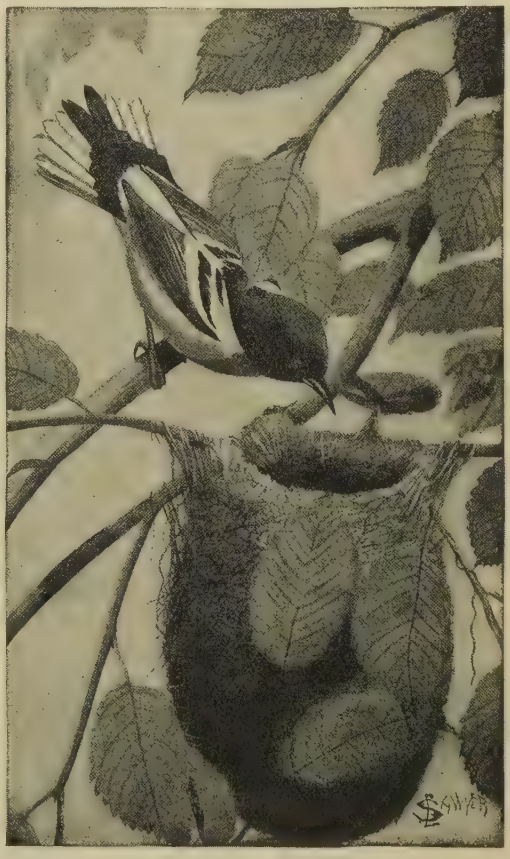
As our "outfit" pulled over the smoothly shaven Missouri-Yellowstone divide, in the month of May, I think we heard that song repeated a thousand times, or less; and when the wind blew hard for five long days without intermission, even that cheerful welcome at last became irritating.

The eastern Meadow-Lark inhabits the eastern half of the United States, and the western species begins at the western edge of Iowa and Missouri; *but neither of them belongs to the Lark Family!*

The Baltimore Oriole,[2] or **Hang-Nest,** has beautiful plumage of orange and black, a very pleasing song, good habits, and therefore is one of our feathered favorites. Either when perching or on the wing, it is a very graceful bird. It is the most skilful builder in North America, and constructs a strong and durable hanging nest which is a marvel of intelligent and skilful effort. The Oriole does not believe in having boys make collections of Oriole eggs. The outermost branches of a very tall and very drooping elm are particularly suited to its views of an ideal building site.

The nest of this Oriole is bound to create in the mind of any one who examines it attentively a high degree of admiration for the mental capacity of its builder. Its superstructure is composed very largely of long, spring-like horse-hairs, so tightly woven together that even when the end of a hair waves freely in the air, it is impossible to pull it out. Here is genuine *weaving*, done with hair and fibrous fragments of soft, weathered bark. Let it be remembered at this point that not even the higher apes know how to *weave* a nest or a roof.

The mouth of the Oriole's bag-like nest is thin but strong, and terminates in an edge as thin and firm as hair-cloth. A nest now before me is



BALTIMORE ORIOLE AND NEST.

five inches long, four inches in outside diameter at a point half-way between bottom and top, and its opening is two inches in diameter. For a space of two inches, the horse-hairs of the upper margin are wrapped around an elm-twig the size of a slate-pencil. *At no point* are the walls more than a quarter of an inch in thickness, and the inside is as symmetrical and shapely as if the nest had been woven around a form.

The usefulness of the Baltimore Oriole is fully equal to its beauty. As a destroyer of cater-

[1] *Sturnella neglecta.* Average length, about 9 50 inches.

[2] *Ic'te-rus gal-bu'la.* Length, 8 inches.

pillars it has few equals among birds. In May, insects constitute 92 per cent of its food, and in April and July 70 per cent. For the entire year, animal food, chiefly caterpillars and beetles, constitute 83.4 per cent of its food, and vegetable matter the remainder of 16.6 per cent.

The Purple Grackle, or **Crow Blackbird,**[1] has prompted scores of persons to ask, "What is the name of that very shiny, jet-black bird with a long tail?" No wonder it attracts attention, especially in contrast with the lustreless rusty blackbird. Its color is deep purple-black, and it is as shiny as if it had been varnished all over. It loves to follow the plough, and pick up the big, fat grubs that are exposed to view, before they have had time to burrow out of sight. Often in their eagerness not to miss a chance, these birds will approach within ten feet of the plough-handles. It is then that one notices that their eyes are light yellow, and very odd-looking. This bird has no song, and its sign of contentment with life is like a great asthmatic wheeze. The tail of this bird is creased lengthwise along the middle, or "keeled."

PURPLE GRACKLE.

Prior to the systematic investigations of the Department of Agriculture the value or harmfulness of the Crow Blackbird was in dispute. The examination of 2,346 stomachs revealed that during an entire year the food supply of this bird is made up in the following percentages: insect food, 26.9; other animal food, 3.4; corn, 37.2; oats, 2.9; wheat, 4.8; other grain, 1.6; domestic fruit, 2.9; wild fruit, 2.1; weed-seed, 4.2; mast, 14; total, 100. "The charge that the blackbird is a habitual robber of birds' nests is disproved by the stomach examinations." (F. E. L. Beal.)

[1] *Quis'ca-lus quis'cu-la.* Length, about 12 inches.

THE CROW FAMILY.

Corvidae.

Take them all in all, there is no Family in the whole Order of Perching-Birds whose members have more striking individual traits, or more commanding personality than the Family which contains the ravens, crows, jays and magpies. All these birds are bold and conspicuous, and fond of entering into the affairs of man. The crow feels it to be his duty to assist in planting-operations. The blue-jay robs you, and scolds while he does it. The magpie will hold a fifteen-minute conversation with you, and tell you of all his troubles. Go where you will in the United States, some of the twenty species of birds of this Family will cheerfully bear you company.

The American Magpie,[2] of the somewhat "wild West," is a beautiful and showy bird, and in winter especially it bravely strives to adorn the bare and bleak valleys, foothills, divides and mountain-sides of the Rocky Mountain region. In the whole of the West, I know of no bird more beautiful in flight than this. Its plumage is half glossy-purple black, and half snow-white; and this, with its extremely long tail streaming after it in its flight, makes it a very striking object. In winter the absence of other birds renders the Magpie trebly conspicuous and welcome. Its flight is slow, dignified, and as straight as an arrow.

The Magpie is fatally fond of fresh meat, and many a fine bird meets its death by devouring poisoned meat laid out for wolves. If hospitably received, this bird will come close to the haunts and camps of man, investigating everything, and looking for scraps of food. If not fired at, it soon becomes very friendly, and a small cabin easily becomes the haunt of a score of birds. Some of those in the Flying Cage of the New York Zoological Park are at times as amusing as monkeys. They come close up to the wires, and when the visitor bends down, to listen or converse, they actually *talk*—in their language. In low, confidential tones they tell

[2] *Pi'ca pi'ca hud-son'i-ca.* Length, about 18 inches.

of their fear of the big condor, the painful pecks they get from the herons, and the greediness of the ducks in devouring all of their kind of food.

In the days of elk and buffalo slaughter, the Magpies feasted continually upon fresh meat. Now they make friends with the ranchmen, and eat all kinds of food. This interesting bird ranges from Alaska, and the edge of the arctic barrens, southward through the great plains and mountains to the arid regions of the South-

Beside his harsh "Jay," a crow is a sweet songster. He will take your cherries right before your eyes, and then scold you roundly for not looking pleasant about it! He robs the nests of other birds, eating eggs or young, whichever may be there; and to that extent he is a pest. During the closed season on eggs and young nestlings, he lives on insects—until berries and small fruits ripen. If Jays were as numerous as English sparrows, it would be necessary to

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west. It is easily kept in confinement, if provided with a large cage and a suitable house, *out-of-doors*.

The Blue-Jay[1] needs no description—only toleration; for his reputation would be all the better for washing. He is a bird of unbounded assurance, and being well known as a marauder, it is only his audacity which saves him from extermination. Externally, he is really a beautiful bird, but his voice is strident and unmusical.

[1] *Cy-an-o-cit'ta cris-ta'ta.* Length, 11.50 inches.

reduce their number; but they are not so numerous or so destructive that we need to attack them.

Steller's Jay[2] is one of the handsomest birds of the moist and dark forest region of the Pacific coast, which extends from Mount St. Elias to San Francisco Bay. It is also the type of three subspecies, or varieties, found farther east and south. It is the Pacific coast counterpart of our blue-jay,—high-crested, barred with black

[2] *Cy-an-o-cit'ta stel'ler-i.* Length, 12.50 inches.

on wings and tail, and with blue as its prevailing color.

The Piñon Jay[1] (pronounced pin'yone) is a bird well worth knowing. On the Sierra Nevada mountains and adjacent plateaus, where the piñon pine, juniper and cedar bravely struggle against the scarcity of water, and only half clothe the rugged nakedness of Nature, this Jay is a welcome habitant. I think it safe to say that you will find it wherever you find the piñon

BLUE-JAY.

pine, whose big, husky cones furnish a generous quantity of seeds, called "nuts," which are good for man, and grand food for all the wild creatures that can crack their delicate shell.

I have never seen the Piñon Jay so numerous that it could be called a "common" bird throughout an extensive region. At the same time, it is a bird of social habit, and given to flocking, quite like our eastern crow. It is really a connecting link between the crows and jays. It has a short, square tail, no crest or "top-knot;" its predominating color is grayish-blue, and its cry is a crow-like "*caw.*"

Clarke's Nut-Cracker[2] is a bird of the western mountain-tops and canyons, and a companion of the mountain-sheep. Wild creatures that love to dwell on high mountains, amid grand scenery, appeal to my affections more strongly than some others. To me, this bird recalls pictures of mountain-parks, "rim-rock," "slide-rock," pines and cedars bravely climbing up steep acclivities, gloomy canyons, and rushing streams of icy-cold water below all.

I first made acquaintance with this bird while hunting elk and mountain-sheep, on a fearfully steep mountain-side, with a magnificent panorama spread out below. It greeted me in friendly fashion with the rasping "Kurr, Kurr!" which, when heard amid such surroundings, is not soon forgotten. It has been my misfortune, however, never to see the remarkable habit thus graphically described by Mrs. Florence Merriam Bailey in her delightful "Handbook":

"Living mainly on the crests of the ranges, the birds fly to the high peaks to get the first rays of the sun, and when warmed go for food and water to the lower slopes. Their method of getting down is startling at first sight. Launching out from a peak, with bill pointed downward and wings closed, they drop like a bullet for a thousand feet, to the brook where they wish to drink. Sometimes they make the descent at one long swoop, at other times in a series of pitches, each time checking their fall by opening their wings, and letting themselves curve upward before the next straight drop. They fall with such a high rate of speed that when they open their wings there is an explosive burst which echoes from the canyon walls."

The head, neck and body of this bird are uniform ashy gray, and the wings and tail are black, with a white patch half-way down the former. The Nut-Cracker is really a small crow, twelve inches long, and much resembles the common gray and black crow of Europe. It is found in all the mountains of the West, from Alaska to Mexico, and straggles eastward to the eastern edge of the Great Plains. It is often called **Clarke's Crow.**

The Canada Jay, Whiskey-Jack, or **Moose-Bird,**[3] is by reason of its personal oddities and assertiveness perhaps the most conspicuous and widely known of all the perching-birds of the great coniferous forests of Canada. Every man who has trailed moose or caribou, or for any reason has camped in the Laurentian wilderness, knows well this audacious camp-follower, and remembers him with interest, if not even friendship. He has no real song, and his cries are

[1] *Cy-an-o-ceph'a-lus cy-an-o-ceph'a-lus.* Length, 11 inches.

[2] *Nu-ci-fra'ga co-lum-bi-an'a.* Length, 12 inches.

[3] *Per-i-so're-us canadensis.* Length, 12 inches.

rather harsh and strident ; but in his native solitudes, where bird-sounds are so seldom heard, the voyageur is always glad to hear his call. And surely, every perching-bird that chooses to brave the rigors of the northern winter instead of migrating is entitled both to respect and admiration.

The plumage of the Canada Jay has a peculiar fluffy appearance, suggestive of fur. Its prevailing color is ashy-gray. The nape and back of the head are black, but the forehead is marked by a large white spot. The wings and tail are of a darker gray than the body. The home of this interesting bird—the companion of the moose, as well as of forest-haunting man—extends from Nova Scotia, and northern New England, throughout Canada to Manitoba, and northward to the limit of the great forests.

The Common Crow[1] needs no description. When finer birds were abundant, we cared little for him; but now that bird-life generally has so greatly diminished, we feel like welcoming him as a friend. His cheerful *"Caw"* is a welcome sound, and his services to the farmer overbalance the bad things he perpetrates. The Department of Agriculture, through Professor F. E. L. Beal, has officially investigated him, published the court records of his case, and pronounced him a bird worthy of protection. It is declared, after an examination of the stomachs of specimens, that the noxious insects destroyed by the Crows—cut-worms, caterpillars, grasshoppers, and also mice—represent a saving of more grain than the bird consumes.

It must be admitted, however, that the Crow does many things he should not. He is too fond of eggs, and also of young birds. He will pull up, by the roots, altogether too much newly planted corn ; which is very unfair toward the farmer. While the damage is seldom serious, it is always annoying; but when the Crow passes the limit of human endurance, powder and lead are his portion. For example: when a Crow nesting in Beaver Valley elected to make visits to our duck-pond where young wild-ducks were hatching, and take three mallard ducklings in one morning, Curator Beebe was compelled to choose quickly between ducks and Crows, and provide for the survival of the fittest.

[1] *Cor'vus a-mer-i-can'us.* Length, 18 to 20 inches.

The American Raven[2] is a bird of the "wild West," quite rare, and seldom seen beyond the mountains. Even when you see it for the first time, you will readily recognize it by its all-black plumage, large size, slow and heavy flight, and its hoarse and seldom *"Quock!"* The crow is at all times a cheerful citizen, but the Raven always has a sore throat, and is always going to a funeral.

He lives with Clarke's nut-cracker and the other dwellers on the mountain-tops north of the arid regions of Arizona and New Mexico, and nests in the crevices of high, rugged cliffs or canyon walls that are as completely inaccessible as can be found. He is suspicious of all attentions, wants no companions save of his own kind, and

Photographed by E. R. Warren.

CLARKE'S NUT-CRACKER.

mighty few of those. The *"Quock"* of a Raven in a rock-ribbed and gloomy canyon is anything but a cheerful sound.

Like the vulture, this bird feeds upon dead animals, dead fish, and sometimes also upon the poisoned meat that wolfers distribute so generously.

[2] *Cor'vus co'rax sin-u-a'tus.* Length, 22 to 24 inches.

THE HORNED LARK FAMILY.

Alaudidae.

There is a Lark Family which we regret to say does not include the *meadow-lark;* for this separation of birds bearing the same general name tends to create confusion. In Europe the Lark Family is a very large one, and contains about a hundred species, the most celebrated of which is the unfortunate skylark. It is unfortunate because of the wholesale and heartless manner in which it is caught and kept in pitiful captivity as a "cage-bird." In London these wretched little creatures are sold by the thousand, sometimes at sixpence each, or even less.

Strange to say, in America the Lark Family is represented by only twelve species and subspecies, of which the **Horned Lark** or **Shore Lark**[1] is the best type. It is called "Horned" Lark because of a small, pointed tuft or brush of feathers which lies along the side of the head above the eye, pointing backward and thrusting its tip through the regular outline of the back of the head. The resemblance of these points to horns is quite far-fetched, but it seems to have been brought in to stay.

This bird looks very much like a small plover. Our eastern species is by habit a shore-bird, whence its second name. It comes to us in winter, in flocks of from six to twenty individuals, and at that season its plumage is not so bright and pleasing as in spring.

The West and Southwest are inhabited by nine subspecies of Horned Larks, ranging all the way from Mexico to British Columbia, some of them necessarily living in hot countries, and far from large bodies of water.

THE FLYCATCHER FAMILY.

Tyrannidae.

There are many little birds, in size next above the sparrows, which look as if they ought to sing; but in reality they do not. They are very expert at catching insects, however, and nothing that flies can escape them in mid-air. These birds make up the Family of Flycatchers, and to the farmers of this country every flycatcher is worth double its weight in pure silver. Altogether there are about thirty species.

The Kingbird,[2] also called the **Bee "Martin"** and **Bee-Bird,** may well stand as the representative of this Family. Whenever you see a small bird swiftly and actively chasing a large crow in mid-air, darting down upon the back of the black fellow every hundred feet or so, with a peck that sends a thrill of life along his keel, you may know that the gallant little warrior is a Kingbird, and it is driving the crow away from the vicinity of its nest. The performance is like that of a man and a mad hornet. The crow thinks not of battle, but only of getting on in the world, and giving the nestlings of his tormentor a good square mile of crowless space in which to grow.

Look long enough, and you will see the Kingbird return from the chase, perch on his favorite dead limb at the edge of the field, smooth his feathers and renew his watch for flying insects. Presently you will see him dart from his perch, swoop to a certain point in space, and then return to his place. He has caught some flying insect, and like Oliver, "wants some more."

Never shoot a Kingbird. It is easier to "identify the species" on the wing than lying dead, all shot to pieces. Without killing this most courageous of all birds—which can whip almost anything that wears feathers, but attacks only crows and hawks—you can see that its colors are bluish-gray, trimmed with black and white.

The *Crested Flycatcher*, the dear little *Phœbe-Bird*, and the *Wood-Pewee* belong to the Flycatcher Family.

[1] *O-toc'o-ris al-pes'tris.* Length, 7.50 inches.

[2] *Ty-ran'nus ty-ran'nus.* Length, 8 inches.

CHAPTER XVII

THE ORDER OF ODD FAMILIES

MACROCHIRES

With certain exceptions, the different Orders of American birds are founded on reasonable grounds and built up of homogeneous materials. As a rule, a few moments' examination of a bird enables one to name the Order to which it belongs. There is no difficulty about the birds of prey, swimmers, fishers, waders or woodpeckers.

Unfortunately, however, Nature has turned out of her workshop so many odd forms that it has been found necessary to have a certain number of Orders for them. In mammals we have seen that the Order *Ungulata* is of this character. In birds, there are two such Orders. One is that which contains the cuckoos, road-runners and kingfishers, and the other is that which forms the subject of this chapter.

The Order Macrochires means literally "odd ones," and its members do not belie the name. On the strength of certain resemblances in anatomical structure, observable only after the birds are dead and dissected, our humming-birds, swifts and goatsuckers (*i.e.*, birds like the whippoorwill and nighthawk) are grouped together in this Order, in three Families, as follows:

	FAMILIES.		EXAMPLES.
ORDER MACROCHIRES.	GOATSUCKERS, .	*CAP-RI-MUL'GI-DAE*, .	Nighthawk, Whippoorwill.
	SWIFTS, . . .	*MI-CRO-POD'I-DAE*, . .	Chimney-Swift.
	HUMMING-BIRDS,	*TRO-CHIL'I-DAE*, . . .	Ruby-Throated Humming-Bird.

THE GOATSUCKER FAMILY.

Caprimulgidae.

The Nighthawk[1] is far from being a true hawk. It belongs to a Family of birds which have soft, owl-like plumage, and enormous mouths, fringed above with a row of stiff bristles, for use in capturing insects on the wing. Many years ago, when people believed many things that were not true, some believed that these big-mouthed birds sucked goats; hence the absurd name applied to the Family.

Whenever, during the hour just before sunset, you see a good-sized bird with dark plumage, long, sharp-pointed wings, and a big white spot on the under surface of each wing,—wheeling, soaring, dropping and circling through the air,—you may know that it is a Nighthawk, catching insects. Its flight is graceful and free, and when

THE NIGHTHAWK.

on the aerial war-path it is a very industrious bird. Some people compare this bird on the wing with bats; but I see no resemblance save the bare fact of semi-nocturnal flight.

[1] *Chor-dei'les virginianus.* Length, about 9.50 inches.

When this bird alights upon a tree to rest, it chooses a large and nearly horizontal limb, on which it usually sits lengthwise. As it sits motionless on a large limb, the bird strongly resembles a knot. This is a trans-continental bird, being found from the Atlantic to the Pacific, in wooded regions, and northward to the Mackenzie River.

The Whippoorwill[1] needs no introduction. It is more than a bird. It is a national favorite.

When the mantle of night has fallen, and the busy world is still, we who are in the country in summer often hear a loud, clear, melodious whistle from somewhere near the barn. As plainly as print, it exclaims, "*Whip*-Poor-*Will'!*" and repeats it, again and again. Before each regular call, there is a faint "*chuck*," or catching of the breath, strong emphasis on the "whip," and at the end a piercing whistle which is positively thrilling.

Sometimes the bird will come and perch within thirty feet of your tent-door, and whistle at the rate of forty whippoorwills to the minute. Its call awakens sentimental reflections, and upon most persons exercises a peculiar, soothing influence. It has been celebrated in several beautiful poems and songs.

The range of this interesting bird is the same as that of the nighthawk. In the South, both are replaced by another goatsucker called, from its whistle, the **Chuck-Will's-Widow.** Until actually hearing it, one can scarcely believe that any bird of this Order can say things as plainly as this bird says "Chuck Will's Wid-ow!" The Pacific states, from British Columbia to Mexico, and eastward to Nebraska, have the **Poor-Will.**

THE SWIFT FAMILY.

Micropodidae.

The Chimney-Swift, or **Chimney-"Swallow,"**[2] has been for a century or more classified with the swallows and martins, but recent studies of its anatomy have caused its removal from their group. This is the bird whose nest and young sometimes tumble down into your fireplace in spring or summer, and cause commotion.

To me, the nesting habits of this bird seem like faulty instinct. A chimney is a poor place of residence for a bird, and the habitants frequently come to grief. If the aperture is small, the householder objects to having the chimney stopped by nests; and if it is large, so many Swifts may nest there that their noise is an annoyance. These birds get up and out before daylight, to hunt insects that fly at night, and doubtless many a "ghost" in a "haunted-house" is nothing more frightful than a colony of these birds in the chimney.

This bird has the ability to fly straight up, or straight down, else it could not enter or leave a chimney. It is quite an aerial gymnast, and feeds only when on the wing. Its flight is very graceful, and both in manner of flight and personal appearance it so closely resembles a short-tailed swallow that there are few persons who can distinguish the difference in the flying birds.

One strongly marked peculiarity of this bird is that the tip of each tail-feather ends in a sharp, wire-like point, caused by the shaft of the feather being projected considerably beyond the vane. The eastern Chimney-Swift ranges westward to the Great Plains. On the Pacific slope is found another species, a close parallel to the preceding, called the *Vaux Swift.* The *White-Throated Swift* of the Pacific States is distinguished by its white throat and breast, and a few white patches elsewhere.

THE HUMMING-BIRD FAMILY.

Trochilidae.

The Ruby-Throated Humming-Bird[3] represents the Family which contains the smallest of all birds. When the trumpet-vine on your veranda is in flower, you will see this delicate creature dart into view, like a large-winged insect, and poise itself easily and gracefully in mid-air at the mouth of the most conspicuous flower. Its tiny wings beat the air with such extreme rapidity and machine-like regularity that you see only a gray, fan-shaped blur on each side of the living bird. It holds itself in position with the greatest exactitude, thrusts its long and delicate beak into the heart of the flower, and, with the skill of a surgeon probing a wound, extracts the tiny insects or the honey so dear to its palate.

[1] *An-tros'to-mus vo-cif'er-us.* Length, about 9.50 inches.

[2] *Chae-tu'ra pe-lag'i-ca.* Length, 5 inches.

[3] *Troch'i-lus col'u-bris.* Length, 3.25 inches.

As the bird poises in mid-air, the sunlight catches the patch of brilliant ruby-red feathers on its throat, and sets it aflame. To make up for their diminutive size, and give them a fair share of beauty, Nature has clothed the throats and

RUBY-THROATED HUMMING-BIRD.

breasts of many Humming-Birds with feather-patches of the most brilliantly iridescent colors,—ruby-red, scarlet, green, blue and gold,—which flash like jewels. Others again have long, ornamental tail-feathers, ruffs, and other showy decorations in feathers.

The Humming-Birds are so very diminutive one never ceases to wonder how such frail and delicate creatures, feeding only upon the smallest insects and the nectar of flowers, can make long journeys over this rough and dangerous earth, withstand storms, build their wonderful little nests, rear their young, and migrate southward again without being destroyed. Of course their diminutive size enables them to escape the attention of most of the living enemies which gladly would destroy them.

The nest of a Humming-Bird is about as large in diameter as a lady's watch, and the eggs, of which there are two, are the size of adult peas. The food of these birds generally consists of minute insects, many of which they find in large flowers. When at rest, perching, the average Hummer is not beautiful in form. Its head seems too large, its neck and body much too short, and its wings too long. It seems top-heavy, and as if destitute of legs. It is on the wing that these creatures look their best.

What Humming-Birds lack in size, they try to make up in number. There are nearly five hundred species, and they are found only in the New World. They are thoroughly tropical, but in warm weather, and the season of flowers, they migrate as far north as Alaska, and as far south as Patagonia. Our country makes an acceptable summer home for about sixteen species.

The Ruby-Throat is the only one inhabiting the eastern half of the United States, all the others being found west of Arkansas, and the Rocky Mountains.

CHAPTER XVIII

THE ORDER OF WOODPECKERS

PICI

The Woodpeckers are the natural protectors of the forests of the temperate zone. But for them, tree-borers would multiply without limit, and the number of trees that would fall before the insect pests is quite beyond computation. While the robin, the thrush and the warblers take care of the caterpillars and the leaf-insects generally, the woodpecker sticks to the business of his own guild, and looks after the pests that attack the bark and the wood. The tree-creepers assist by picking off insects from the outside, but when it comes to the heavy work of digging borers out of the bark by main strength, the woodpecker is the only bird equal to it.

There are about twenty-five species of woodpeckers in the United States.

Usually, the long, barbed tongue of this bird is sufficient to spear a borer, and drag it forth to meet the death it deserves. When this will not do the work, the woodpecker's claws take a good grip on the bark, and serious work begins.

Do not think, however, that because a rolling tattoo beaten on a hard dead limb can be heard a quarter of a mile, that the bird making the noise is working unusually hard. Quite the contrary. The loud tattoo is a signal, like the "certain whistle" of a small boy. In our Beaver Pond, the golden-winged woodpeckers sometimes beat on the galvanized-iron drums which protect the bases of the trees from the teeth of the beavers.

When a woodpecker is working hardest, you hear only a faint "chuck! chuck! chuck!" as he drives his sharp, wedge-like beak into the bark, or soft wood. Often the falling chips are your first notice that a winged forester is at work aloft, digging out and devouring the larvae that, if left alone, bring decay and death to trees.

You may be sure that whenever you find one of these valuable birds at work, there is need for him. To-day, a great many persons know their value, and protect them. Occasionally, however, men who are so thoughtless or so mean as to engage in the brutal pastime known as a "side hunt," do lower themselves, and injure the landowners about them, by killing every woodpecker that can be found,—for "points." If all farmers only knew what a loss every "side hunt" means to them, such wicked pastimes would not be tolerated.

Although the woodpeckers are not counted as birds of song, to me the loud, joyous cry of the flicker, the downy and the red-head, ringing through the leafy forest aisles, is genuine music. One species cries "*Cheer*-up! *Cheer*-up!" and it cheers-up and thrills me to hear it. Even in summer, when other birds are plentiful, it is a welcome sound. In bleak winter, when the great bulk of bird-life has vanished southward, and you toilsomely tread the silent forest, ankle-deep in snow, the world seems lifeless and drear—until you hear the clarion greeting of the golden-winged woodpecker. It is enough to stir the soul of a Digger Indian with a pleasing sense of companionship in life.

It is only the children of the cities who need to be told that woodpeckers have two toes in front and two behind, to enable them to cling to tree-bark; that the natural perch of such a bird is the perpendicular trunk of a tree; that sometimes they store acorns in holes which they dig in the sides of decayed trees, not in order that worms in those acorns may develop, but in order to eat the acorns themselves. They nest high up in hollow tree-trunks, which they enter through round holes of their own making.[1]

[1] Those who are specially interested in the habits of woodpeckers may profitably consult a report on "The Food of Woodpeckers" by Prof. F. E. L. Beal, published by the Department of Agriculture in 1895. The exact proportions of the various kinds of food consumed by seven species have been determined by examination of the stomachs of several hundred birds, and the figures quoted later on are from that report.

It is a good thing to feed wild birds of all species that are either useful or beautiful. The woodpeckers are the largest insectivorous birds that remain in the North over winter, and they appreciate friendly offerings of suet or fat pork, nailed high up on conspicuous tree-trunks. In the Zoological Park we put up every winter at least twenty-five two-pound strips of fat pork, for the woodpeckers and chickadees which live with us all the year round.

The Golden-Winged Woodpecker[1] is my favorite of the members of this Order. It is a bird of good size, dignified in bearing, decidedly handsome, and a great worker. He loves to hunt insects on the ground, occasionally, but is very alert and watchful, meanwhile. If you approach too near, he leaps into the air, and with a succession of wave-like sweeps upward and downward, his golden wings flash back one of his names as he flies to safety on some distant post or tree. Unlike most birds of this Order, this species frequently perches crosswise on a limb, like a true perching-bird.

This is the woodpecker of many names, some of which are *Flicker*, *High-Hole* and *Yellow-Hammer*. His regular call sounds like *"Cheer up!"* but in spring he gives forth a call which comes very near to being a song. When written out, it is like *"Cook-cook-cook-cook!"* At that season, also, you hear this bird beat the "long roll," on a drum which Nature provides for him in the shape of a hollow tree with a thin, hard shell. The rapidity and force with which the bird strikes the blows producing this sound are almost beyond belief.

An examination of the stomach contents of many specimens of this species showed 56 per cent of insect food, 39 vegetable, and 5 mineral. Of the insect food, ants made up 43 per cent and beetles 10 per cent. The vegetable food represented two kinds of grain (corn and buckwheat), eighteen kinds of wild berries, and fifteen kinds of seeds, mostly of weeds. Out of ninety-eight stomachs examined in September and October only four contained corn. Practically, this bird does no damage to man's crops, but destroys great quantities of harmful insects.

The range of the Golden-Wing embraces the eastern half of the United States to the Rocky Mountains, where it is met by the *Red-Shafted Flicker* of the Pacific slope.

The Red-Headed Woodpecker[2] need not be described, because, in "Hiawatha," Longfellow has immortalized it. This bird, "with the crimson tuft of feathers," was the identical Mama which gave Hiawatha the timely tip which enabled him to put the finishing touch to old Megissogwon, and so end in triumph "the greatest battle that the sun had ever looked on."

GOLDEN-WINGED WOODPECKER.

As a return for this kindness, Hiawatha did the one mean act of his life. He took Mama's little red scalp, and "decked" his pipe-stem with it,—as coolly as if he had been a modern servant-girl decorating a forty-nine-cent hat.

This is a very showy bird, and recognizable almost as far as it can be seen,—brilliant crimson head and neck; white breast, sides and rump, and jet-black back and tail. In the Mississippi Valley, thirty years ago, this was one of the most common birds. Now, thanks to man's insatiable desire to "kill something" that is un-

[1] *Co-lap'tes au-ra'tus lu'te-us.* Length, about 12 inches.

[2] *Mel-an-er'pes e-ryth-ro-ceph'a-lus.* Length, 9½ inches.

protected, it has been so greatly reduced in number that it is seldom seen. It is an omnivorous feeder, eating insects, fruit, beech-nuts, corn and other grain, according to necessity. Its cry is loud and far-reaching, and sounds like *"Choor! Choor!"* As to migrating, it seems unable to make up its mind whether to become a "regular migrant" or a "winter resident."

RED-HEADED WOODPECKER.

Sometimes it migrates southward during the early winter, and sometimes it winters in the North.

An examination of the stomachs of one hundred and one Red-Headed Woodpeckers revealed 50 per cent of animal food and 45 per cent vegetable. Of the former, ants made up 11 per cent, and beetles 31 per cent. The fruit and vegetable food represented five kinds of cultivated fruit (strawberries, blackberries, cherries, apples and pears), and fifteen kinds of wild fruit and seeds. The insect food consisted of ants, wasps, beetles, bugs, grasshoppers, crickets, moths, caterpillars, spiders and thousand-legged worms. In the fruit season, the Red-Head undoubtedly does considerable damage to fruit crops, more by mutilating fruit, perhaps, than by actual loss through fruit wholly consumed; and if these birds were as numerous as sparrows, it would be necessary for fruit-growers to take precautions against them during the fruit season. The damage done to corn appears to be quite insignificant. (Professor F. E. L. Beal's report.)

The great fondness of the Red-Head for beech-nuts, and its habit of storing them up for winter use, in holes and crevices, are well known.

The Ant-Eating Woodpecker[1] of the Pacific slope is the most conspicuous and interesting bird of this Order in that region, either around the suburban home, on the ranch, or in the mountain forests. This is the species which is now celebrated in word and picture for its habit of digging hundreds of holes in soft bark or dead tree-trunks, and "storing" an acorn in each hole, for future food.

The Downy Woodpecker[2] is a small gray-and-black species, modest and quiet in demeanor, but quite as common about the haunts of man as the golden-wing. It is the smallest species found in the United States and is the one which is most in evidence in winter.

This bird ranks high as a destroyer of insects, and in the percentage of insect food consumed leads all other woodpeckers that have been studied by the Biological Survey of the Department of Agriculture. An examination of one hundred and forty stomachs revealed 74 per cent of insect food and 25 of vegetable. The vegetable food consisted chiefly of seeds of the poison ivy, poison sumac, mullen, poke berries, dogwood and woodbine. The fruits consisted of service berries, strawberries and apples.

Apparently this bird is almost worth its weight in gold to the farmer who has valuable trees and fruit; and in winter, the farmer who is wise will put up suet, fat pork, and bones bearing some raw meat, on the trees in his orchard and woods.

[1] *Mel-an-er'pes for-mi-civ'o-rus.*

[2] *Pi'cus pu-bes'cens me-di-an'us.* Length, 7 inches.

The Black-Crowned Night-Heron[1] breeds all around New York City, and every summer two or three come and try to break into the great Flying Cage of the New York Zoological Park. As its name implies, this bird has a crown of glossy black feathers, with two or three long white occipital plumes. This is a southern bird, but it breeds as far north as Massachusetts and Illinois. Like its twin, the *Yellow-Crowned Night-Heron*, it is half nocturnal in its habits. When at night in Florida you hear a bird say "*Quawk!*" and repeat it to you from the depths of the mangroves as your boat glides by, you know it is a Night-Heron. Both these species have beautiful plumage, and are handsome birds. Their distinguishing marks are, thick bodies, and short, thick necks; short legs (for herons), and two or three round, wisp-like plumes from five to seven inches long growing out of the top of the head, and drooping backward.

The Snowy Heron, or **Snowy Egret,**[2] when fully adult, is the most beautiful white bird in all the avian world. Its form is the embodiment of symmetry and grace, its plumage is immaculate, and the filmy "plumes" on its head and back are like spun glass. Its black legs and bill merely serve to intensify the whiteness of its feathers.

Stoppage of the use of Wild Birds' Plumage with Millinery.—In 1913, in the new Tariff Act then passed, Congress inserted a far-reaching paragraph that at once absolutely prohibited the importation into the United States, or the possession or sale therein, of all plumage of wild birds for commercial purposes of any kind. This went into effect for the whole United States and our colonial possessions on October 4, 1913. This Act soon had the effect of completely ending in the United States the feather millinery evil; and its protection covered *the birds of the world.*

In 1914 a precisely similar Act was passed by Canada; and a few years later the Government of the Straits Settlements of the East Indies took similar action. Along with this the Provinces of Australia enacted laws which accomplished practically the same purpose. At the close of the war, after five years of vigorous work by the Royal Society for the Protection of Birds, the British Parliament passed a plumage prohibitory Act almost as good as ours. About 1917 the Government of the Netherlands adopted important measures in New Guinea for the preservation of the ill-fated Birds of Paradise, that great source of "Paradise" supply.

In practical effect, the millinery-plumage trade

LITTLE GREEN HERON.

that up to 1913 was a terrible scourge to the world's most beautiful wild birds, now is virtually a vanished industry. The loss of the American market in 1913 was the fatal blow. The manufacturing milliners changed their styles and their methods so deftly that few, if any, feather operatives were thrown out of employment. In the United States the few smugglers who have tempted fate have fared so badly that we hear no more of their unlawful activities.

The American Egret, or **Great White Egret,**[3] is, when adult, our second largest bird

[1] *Nyc-ti-co'rax nycticorax nae'vi-us.* Length, 24.50 inches.

[2] *E-gret'ta can-di-dis'si-ma.* Length, about 23 inches.

[3] *Her-o'di-as e-gret'ta.* Length, about 40 inches.

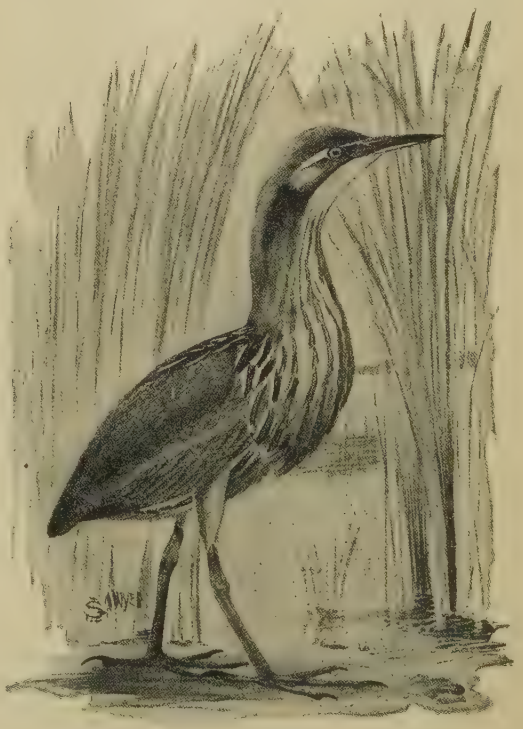
GREAT WHITE EGRET.

of the Order of Herons with pure white plumage, the great white heron being the first. Much to the misfortune of this species, it possesses about fifty "aigrette" plumes which droop in graceful curves from the middle of its back, far beyond the tail and wing tips. For these beautiful feathers this bird also has been pursued by plume-hunters, to the point of total extermination. A very few individuals are yet living in Florida, but they will all be blotted out within a short period.

The American Bittern[1] is a fairly large bird, of a yellowish-brown color, elaborately mottled and streaked with various shades of light and dark. When standing in concealment, it draws in its neck until it wholly disappears in its plumage. The result is an egg-shaped bird, with a beak at the small end, pointing heavenward, and short, thick legs below. I have seen a Bittern stand motionless in that idiotic attitude for nearly an hour at a time. Even in the whirling gayety of a big Flying Cage, it takes life sadly, and never makes merry, as do all other birds, even the funereal vultures. Standing erect, however, the Bittern is a bird with a fair length of neck; but its neck seems much too large and heavy for its body.

Because of the peculiar sound it utters, the Bittern is called the "*Stake-Driver*," and "*Thunder-Pumper*." I have never heard thunder pumped, but with stake-driving am quite familiar, and must say that I never heard a Bittern give forth a cry that sounded like it. I think also that the "booming" of the Bittern should be taken subject to inspection and approval; for to at least one tympanum there is a wide difference between a real "boom" and the alleged "boom" of the Bittern.

This bird inhabits sloughs and marshes of tall, rank grass, in which it hides most successfully by standing very erect, and pointing its beak toward the zenith. It feeds chiefly upon frogs, small snakes, lizards, and crawfish.



AMERICAN BITTERN.

[1] *Bo-tau'rus len-tig-i-no'sus.* Length, 26 inches.

The Least Bittern[1] is the smallest member of the Heron Order,—a queer little brownish-yellow and black creature, duly mottled, of course, with a sparrow-like body, and a wide, flat neck several sizes too large for the body of the bird. On the whole, it is a pretty little creature, associated by habit with the long-billed marsh-wren, the rail, and the red-winged blackbird.

THE STORK FAMILY.

Ciconiidae.

The real Storks are found only in the Old World; but the **Wood Ibis**[2] is a member of the Stork Family, and he looks it. He is a big, burly, bald-headed, good-natured bird, standing 31 inches high. No matter what goes on around him, he is as solemn as an owl. Although large enough to do much damage to birds smaller than himself, he associates with herons, ducks, geese, and ibises, of all sizes, without the slightest desire to harm any of them, or even to rule them. In a large bird, capable of much mischief, such perpetual good temper is worthy of note.

When this bird is adult and clean, its plumage is pure white, and it is a noteworthy member of any feathered community. Specimens are nearly always procurable in Florida at a reasonable price ($8), and there are always several in the New York Zoological Park. This species "breeds in Florida and the Gulf states, after which it wanders north as far as Kansas, Indiana and New York." (F. M. Chapman.)

THE IBIS FAMILY

Ibididae.

In North America this Family contains three species of birds that are heron-like in general form, but are quite differently provided as to their bills. The bill of a true ibis is long, slender and curved, much like that of a long-billed curlew, and it is fitted for probing in soft earth, or shallow water. The neck is round, and the head also, instead of being flat-sided like that of a heron.

The White Ibis[3] is yet found in Florida, and excepting the four outer wing-feathers (primaeris), which are black, it is a pure-white bird. Specimens in the first year are grayish-brown and white, and in color do not even suggest the pure-white plumage of the second year, and thereafter. This species rarely comes into any of the northern states.

The beautiful and brilliant **Scarlet Ibis,**[4] once a habitant of southern Florida and Louisiana, is no longer found in the United States. In color it is one of the most brilliant birds in all America, though by no means so beautiful as the resplendent trogon. I saw it in great numbers on the mud-flats at the mouth of the

WHITE IBIS.

Orinoco, and shot it on the coast of British Guiana. On Marajo Island, in the delta of the Amazon, it breeds in hundreds—a sight worth a long journey to see. Unfortunately, it is impossible to keep specimens of this species in confinement and have them retain their color. In a few months they fade until they are pale pink.

The Glossy Ibis[5] is a dark-colored bird, its prevailing color being rich brownish-purple with metallic-green reflections, and abundant iridescence. It *seems* smaller than the two light-colored species mentioned above, but in reality it is not. In 1899 two specimens were captured on the St. Johns River, opposite Melbourne, Florida, and one of them lived two years in the Zoological Park. This species is rare, even in Florida, but in Texas and the Southwest the *White-Faced Glossy Ibis* is of more frequent occurrence.

[1] *Ar-det'ta ex-i'lis.* Length, 13 inches.
[2] *Tan'ta-lus loc-u-la'tor.* Average length, 38 inches.
[3] *Guar'a al'ba.* Average length, 24 inches.
[4] *Guar'a ru'bra.* Length, 23 inches.
[5] *Pleg'a-dis au-tum-nal'is.* Length, 23 inches.

THE SPOONBILL FAMILY.

Plataleidae.

The Roseate Spoonbill,[1] or **Pink "Curlew,"** is the only member of the Spoonbill Family in America, and it is also the farthest from the type of the Order Herodiones. It is really an ibis with a wide bill which terminates in two rounded, flat plates, nearly two inches wide. When standing erect, it is about 16 inches high. Its body plumage is either rosy gray or white, and its wing coverts and secondaries are tinted a delicate and very beautiful rose-madder pink, the color being most intense on the lesser coverts.

Once quite abundant throughout the lagoons, streams and swampy districts of Florida, this beautiful bird is now so nearly extinct there that no live specimens have been obtainable nearer than the Gulf coast of Mexico. Indeed, until very recently there were good reasons for the belief that not one Roseate Spoonbill remained alive anywhere in Florida. Now, however, it is a pleasure to record the fact that this species has not wholly disappeared from our avifauna.

In *The Auk* for January, 1904, Mr. A. C. Bent describes the finding of a few small flocks of these birds near Cape Sable, which he found nesting in two localities. "The principal breeding-ground of the Roseate Spoonbills was a great morass on the borders of Alligator Lake, a few miles back from the coast near Cape Sable, where the mangrove islands in which the birds were nesting were well protected by impenetrable jungles of saw-grass, treacherous mud-holes, and apparently bottomless creeks. . . . The Spoonbills were here in abundance, and had eggs and young in their nests, in all stages, as well as fully grown young climbing about in the trees. The old birds were tamer than at Cuthbert Lake, and allowed themselves to be photographed at a reasonable distance.

"The Spoonbills," continues Mr. Bent, "will probably be the next to disappear from the list of Florida water-birds. They are already much reduced in numbers and restricted in habitat. They are naturally shy and their rookeries are easily broken up. Their plumage makes them attractive marks for the tourist's gun, and they are killed by the natives for food. But fortunately their breeding-places are remote, and almost inaccessible; and through the earnest efforts of the A. O. U. wardens they are now protected. It is to be hoped that adequate protection in the future will result in the preservation of this unique and interesting species."

The nests found by Mr. Bent on Cuthbert Lake, almost on the edge of the Everglades, were built in red mangrove-trees on the edge of the water, all on nearly horizontal branches, from 12 to 15 feet from the ground. "They were well made, of large sticks, deeply hollowed, and lined with strips of bark and water-moss. One nest contained only a single, heavily incubated egg, one a handsome set of three eggs, and the other held two downy young, not quite half grown."

In my opinion, there is no "cause," either existent or creatable, not even the "cause of science," which could justify the killing or capture of any of the birds composing those last small flocks of Spoonbills. Not even the necessities of a zoological garden should for one moment be accepted as an excuse for meddling with that avian remnant; and let no hunter think of offering a bargain in live Spoonbills from Cape Sable, or of now writing to ask "What will you give?"

It is to be hoped that the people of Florida will see to it that the Spoonbill is absolutely protected for the next twenty years, with the same intelligent interest and humane reason that has saved the manatee down to 1903.

[1] *A-ja'i-a a-ja'i-a.*

ROSEATE SPOONBILL.

CHAPTER XXVII

THE ORDER OF FLAMINGOES—A CONNECTING LINK

ODONTOGLOSSAE

The long-legged, long-necked **Flamingo** is a very perfect connecting link between the wading-birds and the swimmers, and a most curiously formed bird. It has enormously long, stilt-like legs, like a heron; but its feet are fully webbed, like the feet of a duck. Its standing height is from 48 to 54 inches. It has a long, slender, crane-like neck; but its thick, broken-backed bill is provided with lamillae along the edges, like the bill of a shoveller-duck. The anatomy of the bill and tongue of this bird is particularly interesting.

New York Zoological Park.

THE FLAMINGO.

This bird is by habit a true wader, and lives and breeds near shallow lagoons, where it can walk in the water, and feed on the bottom.

In 1902, Mr. Frank M. Chapman, of the American Museum of Natural History, visited a great breeding-place of the **American Flamingo,**[1] on Andros Island, Bahamas, where he saw about 700 birds in one flock, and about 2,000 mud-nests in one group, situated on a level mud-flat close beside a shallow lagoon.

The nest of this queer bird proved to be a low, flat pillar of mud from 6 to 12 inches in height, 13 inches in diameter at the bottom, and 10 inches across the top—which is flat, and slightly depressed.[2] The eggs are two in number.

Up to 1915 young Flamingoes frequently were brought to New York by dealers, from the Bahama Islands and Cuba, and sold at $20 each. Since that time, however, all the Bahama rookeries save one have been destroyed, and now it is only at long intervals that any American Flamingoes are brought to New York. It is not at all probable that any wild flocks ever again will visit the United States. The feeding habits of this bizarre bird are so peculiar its survival is difficult.

In all the world there are eight species of flamingoes. While our species is bright scarlet, all over, those of Europe and Africa are almost white, with pink wing coverts. The food of this bird in captivity is dried shrimps, boiled rice, and cubes of stale bread, fed in water. In a room which is warmed to 60° F., it can live all winter, wading half the time in water that is almost icy cold, without catching cold. The voice of this bird is fearfully and wonderfully made. It is a resonant, deep bass, utterly unmusical "*honk,*" like a rasping blast on a large tin horn, blown by an amateur.

[1] *Phoe-ni-cop'ter-us ru'ber.* Length, 45 inches; spread of wings, 62 inches; tarsus, 12.50 inches.

[2] *Bird Lore* Magazine. IV., p. 180.

CHAPTER XXVIII

THE ORDER OF DUCKS, GEESE, AND SWANS

ANATIDAE

We have now reached the first Order of a great group of birds which might well stand as a Subclass—the Web-Footed Swimmers. It embraces six different Orders, and before touching any one of them, it is highly necessary that the student should take a bird's-eye view of the whole subdivision. A clear conception of these six Orders, and the characters on which they are based, will be of great and perpetual service to every person who desires a comprehensive view of the avian world:

THE ORDERS OF SWIMMING-BIRDS.

		ORDERS.	
THE WEB-FOOTED BIRDS.	**FLYING SWIMMERS:** with good wings.	**Ducks and Geese** (three toes webbed).	*AN-A-TI'DAE.*
		Fully Palmated Birds (four toes webbed). Cormorants, Pelicans, Snake-Birds, etc.	*STEG-AN-OP'O-DES.*
		Tube-Nosed Swimmers. Albatrosses and Petrels.	*TU-BI-NA'RES.*
		Long-Winged Swimmers. Gulls, Terns, etc.	*LON-GI-PEN'NES.*
	DIVING SWIMMERS: with small wings, or none for flight.	**Weak-Winged Divers.** Loons, Grebes, Auks, Puffins.	*PY-GOP'O-DES.*
		Flightless Divers. Penguins.	*IM-PEN'NES.*

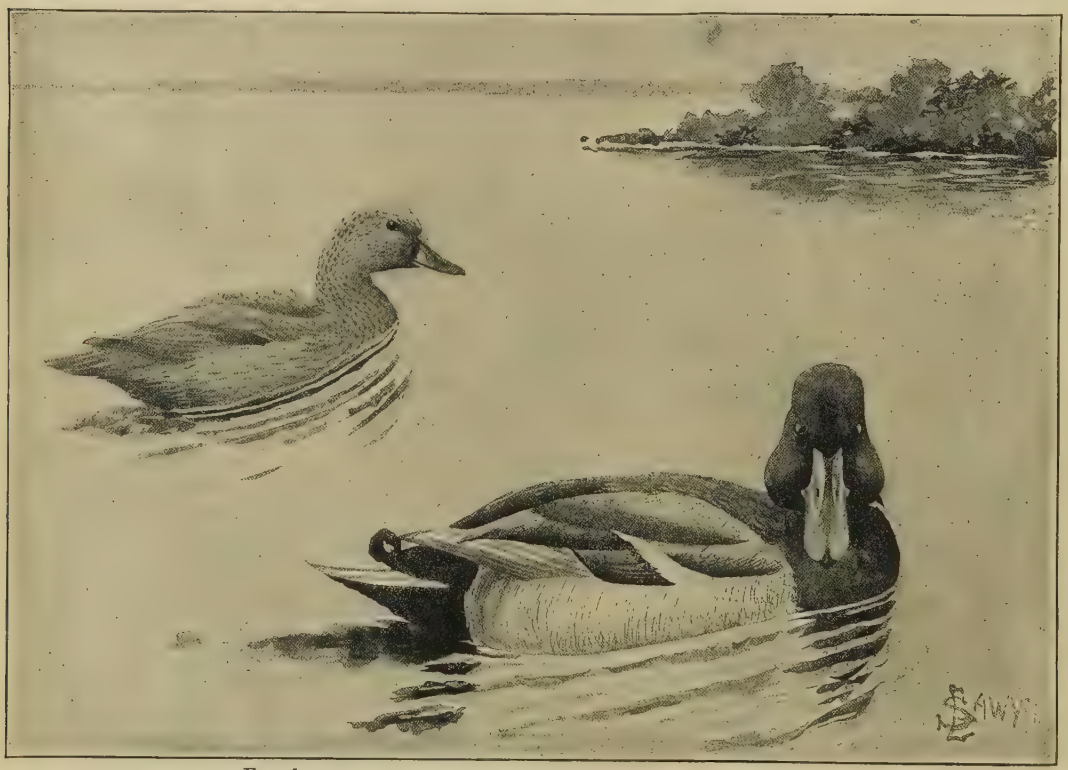
This group is not only extensive, but its members show a wide diversity in form and habits, and they are fitted for life in all climates, on waters great and small. Having before us such a host of swimming-birds that six Orders are necessary to classify them, it is difficult to select only a few examples, and resolutely exclude all others. However, the student who becomes permanently acquainted with about thirty-five web-footed birds specially chosen to represent these Orders, will have a very good foundation on which to build higher, with the aid of special books and specimens.

As heretofore, we will take up the selected examples in the order in which it is easiest for the student to receive them,—the highest types first,—rather than in the very curious sequence adopted by the A. O. U., and most technical writers on birds.

Once a year, the grand army of birds of the Order *Anatidae* take wing, and sweep northward from the tropics and sub-tropics. Many halt in the temperate zone, where food is abundant, but many more press on to the arctic circle, and far beyond it. Wherever they pause for the summer, they nest and rear their young; and many pages might be filled with descriptions of the different kinds of nesting-sites and nests.

One would naturally suppose that in any civilized country, birds in flight to their breeding

grounds would be immune from the attacks of gunners. This immunity was secured in 1916 through the international Migratory Bird Treaty with Canada. Universal bag limits on water-fowl and shore birds were secured at the same time. The fight to stop market shooting was won in 1911 and 1912, on both the Atlantic and Pacific coasts, by the action of the legislatures of New York, Massachusetts, and California in closing their markets against the sale of game.



Female. Male.

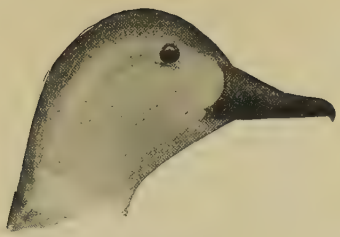
THE MALLARD DUCK.

In 1910 Atlantic coast ducks and geese were growing alarmingly scarce, and the closing of the largest game markets produced immediate results. The migratory bird treaty extended this sale-of-game prohibition over all the states that had not previously taken action to stop it.

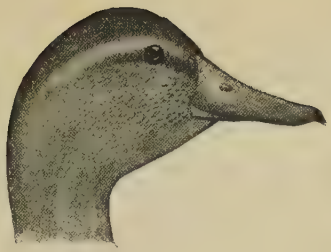
The treaty and its three reforms produced immediate results in increasing water-fowl, and today millions of persons sincerely believe that all migratory game is "safe." But this is not true. The enormous increase in hunters since 1916, and the super-deadliness of the automobile in hunting, about 1920 again started migratory game on the downward track. Up to 1927, just one-half the states of our Union have felt compelled to reduce bag limits on water-fowl approximately forty per cent below the U. S. Government rules, to save their state ducks and geese from utter extermination. A great fight is now on to reduce bag limits all over the United States, and if it is not won, the edible ducks and geese are doomed.

During the autumn migration southward, the flocks run a gauntlet of guns a thousand miles long. Whenever and wherever a duck or goose alights to rest and feed, the guns begin to roar. The more important migration routes, like the Atlantic coast and the Mississippi valley, literally teem with roaring guns and flying shot.

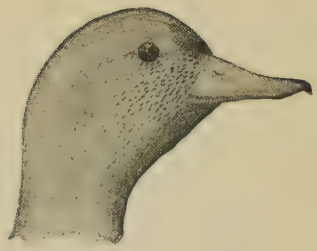
North America is—or *was*—particularly rich in species of birds belonging to the Order *Anatidae*, and once was richly stocked with individuals. Even yet, a very interesting remnant remains. Of the whole assemblage of species,



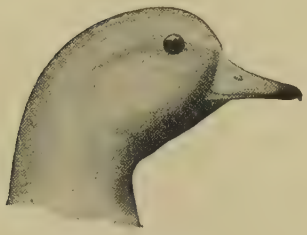
FULVOUS TREE-DUCK.
Dendrocygna fulva.



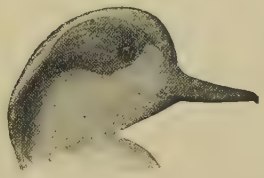
BLACK DUCK.
Anas obscura.



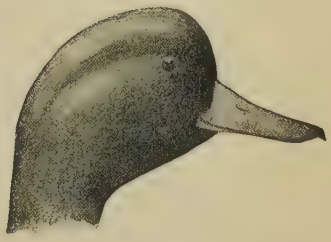
GADWALL: GRAY DUCK.
Chaulelasmus strepera.



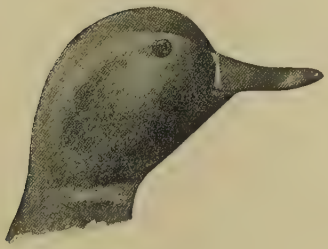
AMERICAN WIDGEON.
Mareca americana.



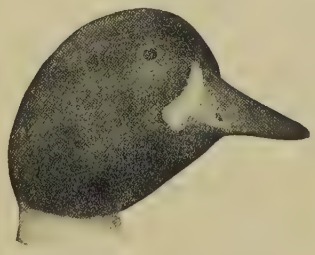
GREEN-WINGED TEAL.
Nettion carolinensis.



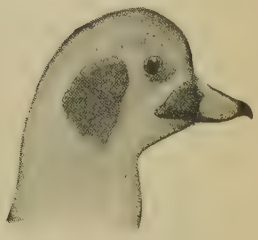
SCAUP DUCK.
Aythya marila.



RING-NECKED DUCK.
Aythya collaris.

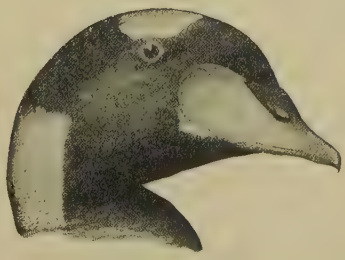


BARROW'S GOLDEN-EYE.
Clangula islandica.

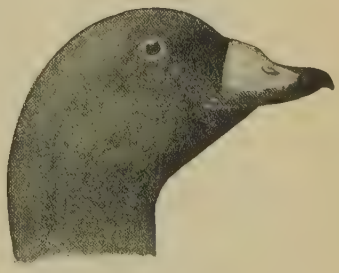


OLD SQUAW.
Harelda hyemalis.

HARLEQUIN DUCK.
Histrionicus histrionicus.



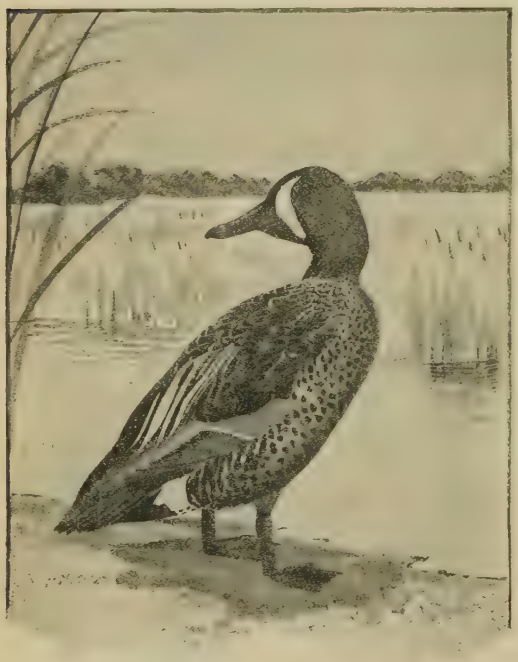
SURF SCOTER.
Oidemia perspicillata.



AMERICAN SCOTER.
Oidemia americana.

great, medium and small, I think the **Mallard Duck**[1] is the highest type, and the best average. It is one of the largest ducks; it is one of the handsomest; it is strong on the wing, and highly intelligent. It is a joy unto the sportsman who finds it in its haunts, and a delight to the epicure who finds it upon the bill of fare. Sluggish indeed must be the pulse which does not beat faster at the sight of a flock of wild Mallards, free in its haunts, and ready to leap into the air and speed away at the slightest alarm.

The Mallard is recognizable by its large size, and the brilliant metallic-green head and neck, and pearl-gray body, of the male. The female is a very different-looking bird, of a modest brown color, streaked with black. There is only one thing at all annoying about this bird, and that



BLUE-WINGED TEAL.

is its close resemblance to our domestic duck; but for this there is a very good reason. It is the wild ancestor of all our domestic ducks, save one or two varieties.

The Mallard is found throughout the temperate zone in both the Old World and the New, and therefore it is known by many names. In England it is called the *Stock Duck*, because it was the original stock from which the domestic duck has descended. In North America its range covers practically the whole continent down to Panama, and in Asia it reaches to India. It breeds persistently throughout the greater portion of its immense range—in the long grass of pond margins; in the woods, between the spur roots of trees; and on the prairies, beside streams of the smallest size.

Once while collecting in Montana, late in May, I found a tiny water-hole, barely ten feet in diameter, hiding in the sunken head of a very dry coulée. For miles in every direction stretched a billowy sea of sage-brush, already shimmering in the heat of early summer. As I dismounted to scramble over the edge of the bank for a drink, up rose a Mallard Duck from her nest in a thick patch of sage-brush, within a yard of my feet.

The nest was the old, familiar type,—a basin of grass lined with a thick layer of down from the breast of the prospective mother, and a bunch of eggs that almost overflowed the boundaries of their resting-place. As I gazed in astonishment at this nest and its contents beside an insignificant bit of water in a landscape that certainly was not made for ducks, I understood how it is that this bird has been able to spread itself all around the northern two-thirds of the globe.

In captivity the Mallard is the best of all ducks, and the most persistent and prolific breeder. Put a flock on any pond having long grass or timber about it, keep away the rats, raccoons, mink, thieves, and other vermin, and each female will do her utmost to surround herself with a downy flock of about fifteen small Mallards, regularly every summer. In the Zoological Park, several nests have been built within twenty-five feet of walks that are in daily use by crowds of visitors, the immunity of their builders being due in each case to their wonderful color resemblance to the dead oak-leaves which surrounded them, and with which they almost covered themselves.

The Blue-Winged Teal[2] represents with us a group of three species which contains the smallest ducks found in North America.

[1] *Anas boschas.* Average length, 22 inches.

[2] *Quer-quedu-la discors.* Average length, 15 inches.

Throughout its home, which embraces the whole United States east of the Rockies, and also far north and far south, it is so common—and also so small—it is not highly prized by sportsmen, and its worst enemy is the sordid market-hunter. Like the other teal, it prefers quiet, inland waters to the wide expanses that back up from the sea.

All the teal are quick risers, and also speedy on the wing; but they are rather dull of sense, and easy to approach. The Blue-Wing is known by the conspicuous white crescent in front of and half encircling the eye, and the bright blue patch, called the "speculum," on its wing.

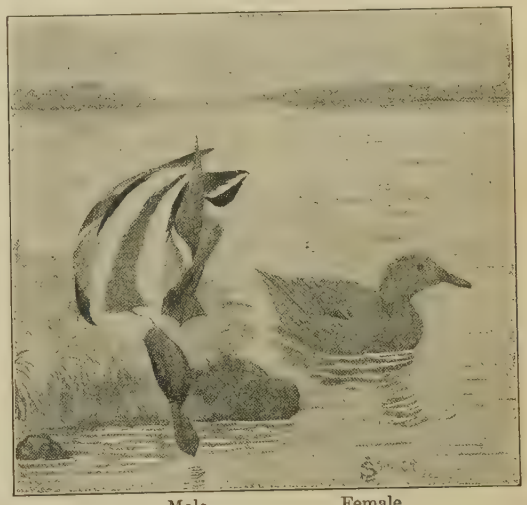
The Cinnamon Teal[1] is a cinnamon-brown bird of the western half of the United States, once common, but rapidly diminishing in numbers. This species is very difficult to keep long in captivity, being very sensitive to all adverse influences.

The Green-Winged Teal[2] has a very noticeable crest, and a beautiful emerald-green speculum on each wing. It is found scattered over practically the whole of North America, from the Atlantic to the Pacific, and from the Barren Grounds to Cuba and Honduras.

The Shoveller,[3] also called the **Spoonbill,** is a handsome duck, recognizable by its extremely broad and spoon-shaped bill—the broadest of any American duck. The head and neck of the male are either black, or dark metallic-green; and the body-colors are black, white, blue, and green, handsomely disposed.

The bill of this bird shows the limit of development in width, and the comb-like lamellae along the outer edges, which are designed for use in straining minute particles of food out of water, are very pronounced. These minute plates are set cross-wise at the edges of the mandibles, and perform the same functon as the plates of hairy baleen, or "whalebone," in the mouth of a baleen whale. All the members of the Order *Anatidae* are provided with lamellated bills, as also are the flamingoes.

This fine duck is a bird of inland waters, and appears to dislike salt water. It is found sparingly "pretty much everywhere throughout the northern hemisphere . . . but is not common in the eastern states, and breeds from Alaska to Texas." Its flight is much like that of a teal, but less swift, and in cruising about for good feeding-grounds it is irregular and hesitating. "The body of the Shoveller is not large, and its apparent size in the air is made up chiefly of wings and head. . . . As a bird for the table, I have held it in very high esteem." (D. G. Elliot.)



Male. Female.

THE SHOVELLER-DUCK.

In captivity it is a difficult bird to acclimatize and keep alive, which for several reasons is to be regretted. The females and immature birds are colored very differently from the adult and perfect males. The following local names of this bird have been recorded by Mr. Elliot in his admirable book on "The Wild Fowl of North America": Blue-Winged Shoveller, Red-Breasted Shoveller, Spoonbilled "Teal," Spoonbilled "Widgeon," Broad-Bill, Broady, Swaddle-Bill and Mud-Shoveller.

I regard the **Pintail,** or **Sprigtail,**[4] as the most beautiful duck in America, not even excepting the wood-duck. On land its outlines are trim, graceful and finely drawn, and on the water it makes one think of a finely modelled yacht. In beauty of form it far surpasses all

[1] *Quer-qued'u-la cy-an-op'ter-a.* Average length, 16 inches.

[2] *Net'ti-on carolinensis.* Average length, 13.50 inches.

[3] *Spat'u-la cly-pe-a'ta.* Average length, 19 inches.

[4] *Daf'i-la a-cu'ta.* Average length of male, 27 inches; female, 22 inches.

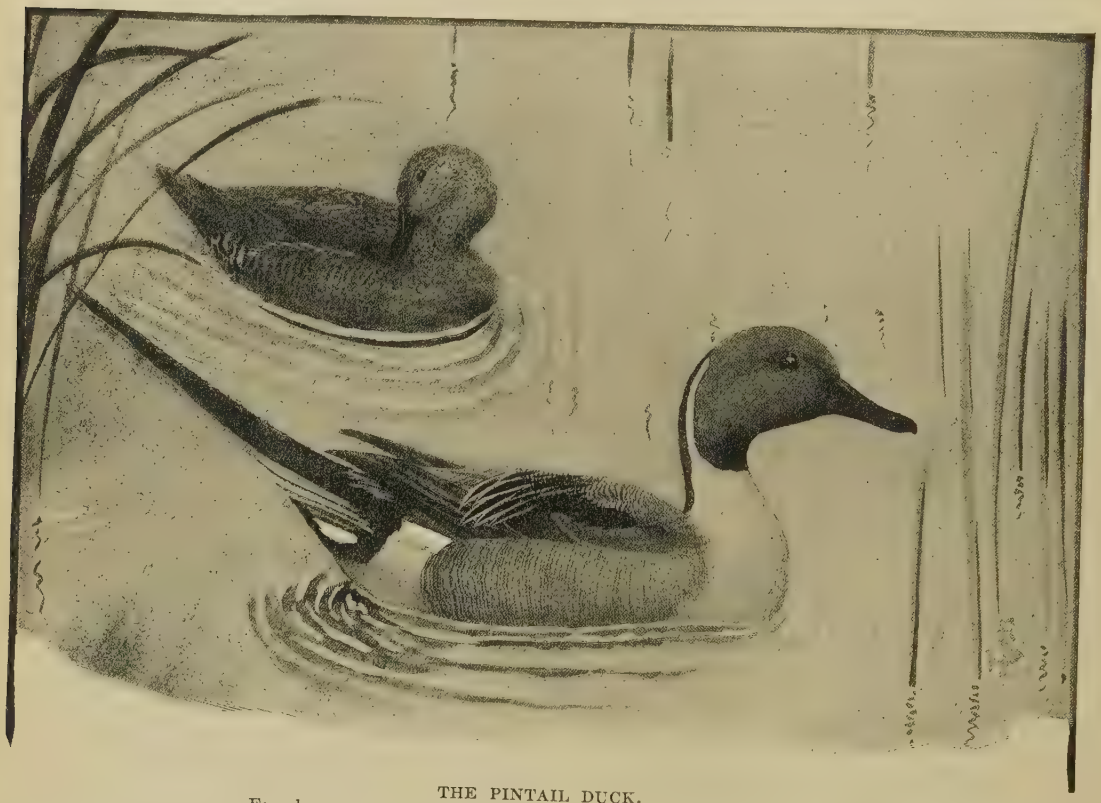
other American ducks; and nowhere among wild-fowl is there to be found a more charming color-scheme than in the plumage of the drake. It is a harmony of delicate drabs, grays and white, used to set off several pleasing shades of brown, black, and iridescent green. None of the colors are gaudy or cheap-looking, and as a whole the combination of form and colors produces a bird that is in every way an exquisite creature.

It is in recognition of its beauty that this duck is sometimes called the *Water-Pheasant*. Its correct name, however, has been bestowed in honor of its 7-inch long, finely pointed tail.

This bird ranges over nearly the whole of North America, but its favorite breeding-grounds are in the subarctic regions, particularly in the Yukon valley, and in the lake regions of the Canadian Barren Grounds. It is equally at home on the fresh-water lakes and rivers of the interior, and the salt-water inlets and channels of the Atlantic coast. The annual migration southward before the advance of snow and ice begins in September. On our Atlantic coast, many of the flocks winter in the labyrinth of sounds, bays and channels that fringe the coast of Virginia and the Carolinas.

During recent years, quite a number of these birds have been caught alive near Water Lily, North Carolina, which is a locality famous for its wild ducks, geese and swans.

Fortunately the Pintail is easily acclimatized, and although not a good breeder, like the mallard, it does well in captivity, and is truly a thing of beauty, and a joy as long as it lives.



Female. THE PINTAIL DUCK. Male.

The beauty of the **Wood-Duck,** or **Summer-Duck,**[1] depends almost wholly upon its brilliantly colored plumage; for its form is quite commonplace. It may be wrong to make a cold-blooded analysis of its points, but for beauty of form, the neck of this bird is too small and too short, its head is too large, and its body is very ordinary. Its plumage, however, presents

[1] *Aix spon'sa.* Average length of male, 19 inches.

a color-scheme of brilliant reds, greens, blacks, browns, yellows and whites which is quite bewildering. Even its weak little bill is colored scarlet and white, and its iris is bright red.

In my opinion the claims of the two duck species which are rivals for the prize for web-footed beauty may fairly be expressed by the following proportion:

The Pintail is to the Wood-Duck as a well-gowned American Woman is to a Chinese Mandarin.

The Wood-Duck needs no description. Among ducks it is equalled in gorgeous colors only by its nearest relative, the mandarin duck of China—a painted harlequin. Our species is a tree-duck, and not only perches on trees, but also makes its nest in them, and rears its young at an elevation of from ten to thirty or forty feet. The nesting-site is always above water, in order that as the ducklings finally scramble out of the nest and fall, they will alight in the water without injury, and quickly learn to swim.

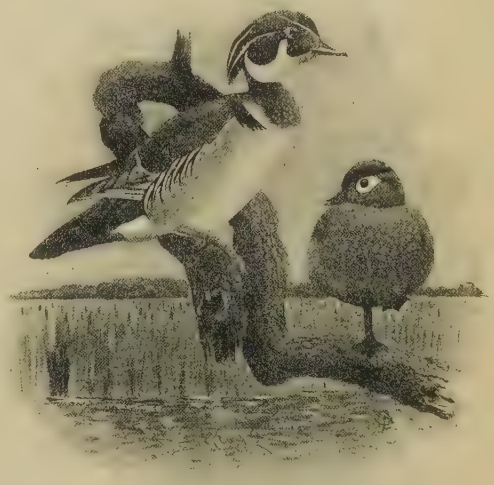
In captivity the best nesting arrangement for this bird consists of a long, narrow box set on end on a stout post, well out in a pond, roofed over to keep out the rain. There must be a hole in one side, near the top, and a slanting board with cross slats reaching up to it from the water, for use as a ladder. The Wood-Duck will sometimes nest on the ground, either in captivity or out. This species is being bred in captivity in England in large numbers, and also with some success in this country. Duck fanciers find no difficulty in purchasing live specimens of this interesting bird at $15 per pair.

During the summer of 1902, a pair of wild Wood-Ducks made daily visits to the Ducks' Aviary in the New York Zoological Park, and in the autumn of that year a small flock settled with the Wood-Ducks, mallards and pintails on the Aquatic Mammals' Pond, and remained there permanently. In the spring of 1903, a fine drake manifested a fixed determination to break into the great Flying Cage, and become a member of the happy family within. After he had flown around the cage two or three times, Keeper Gannon opened wide the wire gates at the north end, drove him in, and he is there now, serene and happy.

The Wood-Duck is a bird of great discernment.

Although this bird is called the Summer-Duck, and migrates far in advance of winter, it winters very comfortably in the northern states if it is fed and continuously provided with open water to keep its feet from freezing. The natural range of this species is from Hudson Bay to the Gulf of Mexico, chiefly on fresh water; but often it is found on brackish sounds and channels along the Atlantic coast where food is plentiful.

Like all other wild ducks that are imperatively needed to keep the American people from starving, there remains to-day about one Wood-Duck where formerly there were from thirty to fifty. Apparently, the only winged creatures that are too beautiful or too good to be shot and eaten are angels; but I doubt if even a white-winged seraph with webbed feet would be safe for half an hour anywhere between Cape Cod and Charleston.



WOOD-DUCK.
Male and female.

The Redhead Duck[1] is one of our largest and best species, and one of the most satisfactory to keep in captivity. It belongs to the same genus as the canvas-back, and in size, habits, table value and beauty it is in no sense

[1] *Ay-thy'a americana.* Average length, 19 inches

whatever inferior to its more famous relative. When shot in the same locality, I think there is no one who could distinguish the two species by a difference in the flavor of their flesh.

In the color of their plumage, the Redhead and canvas-back look so much alike that the casual observer might easily mistake one species for the other. Both have heads and necks of solid rusty brown, but the head-color of the Redhead is the more intense and conspicuous.

The head of the Redhead has a *high and well-rounded forehead and crown*, while that of the canvas-back is *wedge-shaped*, the forehead forming a *straight line with the top of the bill*. The Redhead has a short bill, with a blue band across it; the other species has a long bill, with no band.

THE REDHEAD DUCK.

The Redhead (like the canvas-back) feeds chiefly upon aquatic plants, its favorite food being the vallisneria, a kind of trailing waterweed which grows in many of the inlets along the Atlantic coast.

Through countless generations of diving after food-plants, the Redhead has become a deep diver. It is accustomed to seeking its food in mid-stream of deep rivers, and in the open water of lakes and sounds, where many other ducks would be quite unable to reach the bottom. Reliable lake fishermen at Lakeside, Orleans County, New York, have informed me that they have taken drowned Redhead Ducks from nets that had been set on the bottom of Lake Ontario, at a depth of *ninety feet*, where the ducks could not possibly have become entangled save in going to the bottom for food. It also appeared that those Ducks sought their food and became entangled only at night. It takes a bold and energetic bird to feed successfully *at night* in ninety feet of water!

Naturally this fine bird has ever been a prime favorite with sportsmen and "market-shooters," and during the past fifteen years its numbers have diminished to about one-fiftieth of what they were prior to 1885. It is as easily deceived by decoys as green hunters are; and in preparing to alight the Redhead flock has a fatal habit of coming together in a manner called "bunching," which is as deadly to the birds as "close formation" is to soldiers in a modern battle.

Much more might be noted regarding this interesting bird, which must be left to the special works on birds. For many reasons it is very desirable that the Redhead should be semi-domesticated, and by protection and breeding in captivity saved from the final blotting out which otherwise will be its fate. While it does not breed in captivity as bravely as the mallard, it *can be taught* to do so, and the prices at which living birds can be procured ($5 each) is so very moderate that experiments with it are not costly.

The distribution of this bird is given as "North America, breeding from California, southern Michigan, and Maine northward;" but in North America there are to-day more lands and waters without this duck than with it. In addition to its best and most appropriate name it is also called *Raft-Duck*, and *American Pochard*.

The Canvas-Back Duck[1] had the misfortune, early in its history, to attract the evil eye of the deadly epicure, whose look of approval is a blighting curse to every living creature upon which it is bestowed. Because of this, the unfortunate Canvas-Back is now little more than a bird of history. It is of no present interest, outside of museums and the zoological parks and gardens which have been so fortunate as to secure a very few specimens. Unfortunately, it has been impossible for even the most energetic duck-fanciers to secure a sufficient number

[1] *Ay-thy'a val-lis-ne'ri-a.* Average length, 22 inches.

THE CANVAS-BACK DUCK.

of unwounded specimens to carry out the experiments necessary to determine the precise conditions under which this species will breed in captivity.

The preceding paragraph was true of the Canvas-Back in 1903. Since 1910, thanks to new protective laws, this species has "come back" to us to such an extent that to-day (1927) there are thousands of Canvas-Backs in place of the hundreds that in 1903 were regarded as the last remnants.

The Buffle-Head Duck, or **Butter-Ball,**[1] is a small, tree-nesting duck, so pretty and so very odd-looking that when seen every one wishes to know its name; and when named, it is not soon forgotten. When you see a short-bodied, plump-looking little duck, black above and white below, with a head that is a great round mass of soft feathers, half snow-white, and half a rich metallic mixture of purple, violet and green, —that is a Butter-Ball, and nothing else. Wherever seen, it commands instant attention.

Unfortunately, this picturesque little creature does not like our country as a summer residence, for it breeds from Maine, Iowa and British Columbia, northward, and returns to us only when snapping cold weather heralds the approach of winter. On the water it is the most nervous and watchful duck that I know, and its habit of constantly turning from side to side is certainly in the interest of self-preservation. But after all, what is the alertness of any duck against the deadly, cold calculation of the greedy "market-shooter" with a choke-bore gun?

The Buffle-Head is one of the ducks that is rarely seen in captivity. A specimen that is so seriously wounded that it can be caught, usually dies a few days later. So far as I know, it has not yet been induced to breed in captivity; but that is no reason for believing that it never will. We hold that if conditions are made satisfactory, any wild species will breed in captivity. Usually it is a question of sufficient seclusion, and immunity from disturbance. The range of this bird is said to include all North America, from the Arctic Ocean to Cuba. And so it does, all save those localities wherein it does *not* occur.

THE BUFFLE-HEAD, OR BUTTER-BALL.

The Harlequin Duck[2] is most fantastically marked. The prevailing colors of the male are dark blue, blue-black and violet, with various white collars, stripes and patches that seem to have been laid on with a paint-brush. This bird is to be looked for along the Pacific coast above Oregon to Japan, and on the Atlantic coast from Newfoundland northward. It is nowhere common, rather solitary, but frequents costal rivers as well as the sea. As a rarity to be prized, one Harlequin is equal to twenty ducks of almost any other species in America.

[1] *Char-i-ton-et'ta al-be-o'la.* Average length, 14.50 inches.

[2] *His-tri-on'i-cus his-tri-on'-i-cus.* Length, 16 inches.

Reproduced from *Recreation* Magazine.

A HAVEN OF REFUGE.

An Object Lesson in Bird-Protection.—As a fitting conclusion to our studies of the ducks of our interior rivers, lakes and ponds, we present a remarkable instance of what bird-protection can accomplish. The picture of the pond described might well be entitled—"An Oasis in the Great American Desert of Game Destruction!" By the courtesy of Mr. G. O. Shields, Editor of *Recreation* Magazine, we reproduce from that periodical for June, 1903, the above illustration, and the following description by Mr. Charles C. Townsend, which appeared under the caption, "A Haven of Refuge."

"One mile north of the little village of Mosca, Colorado, in San Luis valley, lives the family of J. C. Gray. On the Gray ranch there is an artesian well which empties into a small pond about 100 feet square. This pond is never entirely frozen over and the water emptying therein is warm even during the coldest winter.

"Some five years ago Mr. Gray secured a few wild-duck eggs, and hatched them under a hen. The little ducks were reared and fed on the little pond. The following spring they left the place, to return in the fall, bringing with them broods of young; also bringing other ducks to the home where protection was afforded them, and plenty of good feed was provided. Each year since, the ducks have scattered in the spring to mate and rear their families, returning again with greatly increased numbers in the fall, and again bringing strangers to the haven of refuge.

"I drove out to the ranch November 24, 1902, and found the little pond almost black with the birds, and was fortunate enough to secure a picture of a part of the pond while the ducks were thickly gathered thereon. Ice had formed around the edges, and this ice was covered with ducks. The water was also alive with others, which paid not the least attention to the party of strangers on the shore.

"From Mr. Gray I learned that there were some 600 ducks of various kinds on the pond at that time, though it was then early for them to seek winter quarters. Later in the year, he assured me, there would be between 2,000 and 3,000 teal, mallards, canvas-backs, redheads and other varieties, all perfectly at home and fearless of danger. The family have habitually approached the pond from the house, which stands on the south side, and should any person appear on the north side of the pond the ducks immediately take fright and flight. Wheat was strewn on the ground and in the water, and the ducks waddled around us within a few inches of our feet to feed, paying not the least attention to us, or to the old house-dog which walked near.

"Six miles east of the ranch is San Luis lake, to which these ducks travel almost daily while the lake is open. When they are at the lake it is impossible to approach within gunshot of the then timid birds. Some unsympathetic boys and men have learned the habit of the birds, and place themselves in hiding along the course of flight to and from the lake. Many ducks are shot

in this way, but woe to the person caught firing a gun on or near the home-pond. When away from home, the birds are as wild as other wild-ducks and fail to recognize any members of the Gray family. While at home they follow the boys around the barn-yard, squawking for feed like so many tame ducks.

"This is the greatest sight I have ever witnessed, and one that I could not believe existed until I had seen it. Certainly it is worth travelling many miles to see, and no one, after seeing it, would care to shoot birds that, when kindly treated, make such charming pets.'

AMERICAN EIDER.

The Group of Eider-Ducks.—The arctic and subarctic regions contain a group of about seven species of large sea-ducks, called eiders (i'ders). The representative species are distinguished by their flat foreheads and wedge-shaped heads; by a long, wedge-shaped point of the cheek-feathers which extends forward and *divides the base of the upper mandible;* and by the possession of more or less bright green color on the head.

On land, the eiders are heavy and clumsy birds, but on the sea they are at home, and dive with great ability. The females line their nests very liberally with down from their own breasts, and this when gathered and utilized becomes the well-known "eider-down" of commerce. Unfortunately, the natives of arctic America are unable to make use of eider-down, save on the skin, and this leads to the slaughter of great numbers of the birds.

Eiders nest on the tops of rocky islets, using sea-weed or grass for a foundation, and covering this with down plucked from their own breasts. So abundantly is the nest lined that by the time the eggs are all deposited they are fairly embedded and covered in the softest of beds. In Iceland, the eider-ducks are half domesticated. The inhabitants collect the down from the nests for sale, and therefore they are much interested in preserving the birds. Nesting-places are made for the birds by building thick stone walls with spacious crevices along each side, at the base, or by scooping out shallow cavities in the hard earth. The Eiders permit their human friends to go among them, and even to handle their eggs.

On the Atlantic coast, from Labrador to Delaware in winter, we have the **American Eider,**[1] which appears to be the best type for the eider group. Fortunately for our chances of close acquaintance with it, this species occasionally penetrates westward along the great lakes to Illinois and Wisconsin—a very unusual proceeding for a sea-duck. Any bird which will go so far out of its natural range in order to become acquainted with interocean Americans surely is worth knowing. Moreover, the eider of the Old World so closely resembles this bird in all essential details that to know one species is to know the other also.

The colors of this bird are black and white, as shown in the illustration, except that the nape and the rear portion of the region around the ear are sea-green, and the tail and the primaries are pale brown. The bill and feet are olive-green.

The Spectacled Eider,[2] of northwestern Alaska, is a bird easily remembered by its name, and the large, white spot around each eye which at once suggests a pair of spectacles. This bird is limited to our arctic territory, and is said, by Mr. E. W. Nelson, to be threatened with extinction by man at no very distant day.

[1] *So-ma-te'ri-a dres'ser-i.* Length, about 23 inches.
[2] *Arc-ton-et'ta fisch'er-i.* Length, about 21 inches.

Our occupation of Alaska, after the Russians, has led to the arming of the natives with modern rifles and shot-guns, before which wild life generally is rapidly being swept out of existence.

The White-Winged Scoter[1] (sko'ter) quite acceptably represents a group of sea-ducks and deep divers, called Scoters, and of which there are three species resident in North America. These are the blackest of all our ducks. The species known as the **American Scoter** is glossy black throughout, without a single patch of color save the bright orange-yellow which colors the basal half of the bill and its knob.

The White-Winged species has a white patch on each wing, technically known as a "speculum," and a white patch of variable shape under or in rear of the eye. Above and in rear of the nostrils the bill and skull together are raised into a conspicuous hump, half covered by feathers.

Like all the scoters, this bird is a fish-eating duck, and its flesh is so fishy in flavor it is not considered fit for the table. It is widely distributed throughout North America down to southern California, northern Missouri, Illinois and Maryland. Like most of our ducks, it breeds in the far north, and returns to us only for the winter. It is a deep and persistent diver, and it is said that when wounded and pursued it will sometimes dive to the bottom, even fifty feet if necessary, seize a bunch of grass or weeds with its bill, and hold on until it has quite drowned. Its food consists of fish, crustaceans and mollusks.

Female. Male.

RED-BREASTED MERGANSER.

The Red-Breasted Merganser[2] bravely and handsomely represents what is structurally the lowest group of ducks, known as the Mergan'sers, embracing three species. The bill of this bird is long, narrow, and set along the edges with lamellae that look quite like sharp teeth—a most admirable arrangement for seizing fish under water. The bill of a Merganser always reminds me of two things: the jaws of the gavial, or Gangetic crocodile, and Professor Marsh's toothed bird, the Hes-per-or'nis, from the great extinct inland sea of the Middle West. One of the common names of this bird is the *Saw-Bill;* and it is peculiarly appropriate.

[1] *Oi-de'mi-a deg-land'i.* Average length, 21 inches.

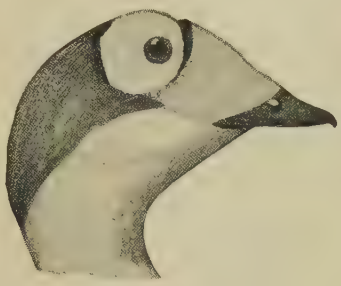
[2] *Mer-gan'ser ser-ra'tor.* Average length, 22 inches

Among other ducks this fine bird has the bold, confident air of a born free-booter. The back of its head is ornamented with several long feathers which form a crest, like the war-bonnet of a Sioux Indian. The whole head and upper neck are black, with green and purple reflections. Around the middle of the neck is a conspicuous white collar, and under that is the pale rusty-red breast, streaked with black, which gives the bird its name.

nervous, and difficult to keep alive in captivity. A fine specimen which we cherished for a time in the Flying Cage of the New York Zoological Park, along with many other water-birds of good size, at first seemed inclined to accept the situation, and become acclimatized; but it lived only two months. With several Mergansers together, the result might be more satisfactory.

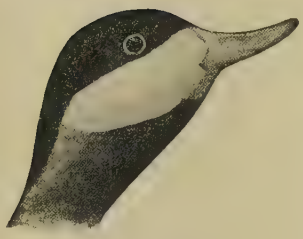
The Hooded Merganser[1] is distinctly

STELLER'S DUCK.
Eniconetta stelleri.



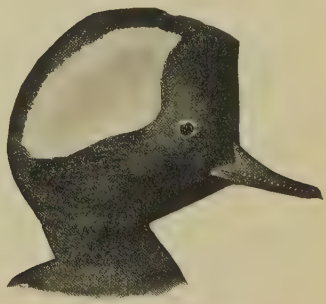
SPECTACLED EIDER.
Arctonetta fischeri.

KING EIDER.
Somateria spectabilis.



RUDDY DUCK.
Erismatura jamaicensis.

AMERICAN MERGANSER.
Merganser americanus.



HOODED MERGANSER.
Lophodytes cucullatus.

This sea-going bird-craft is at home—under many names—in both the Old World and the New. On our continent it breeds from our northern states as far as the Aleutian Islands and western Alaska, where the Aleuts prize it for food above all other ducks. In winter it migrates along our two ocean coasts to southern California and Florida. It feeds entirely on fish, and the flavor of its flesh is rank and disagreeable.

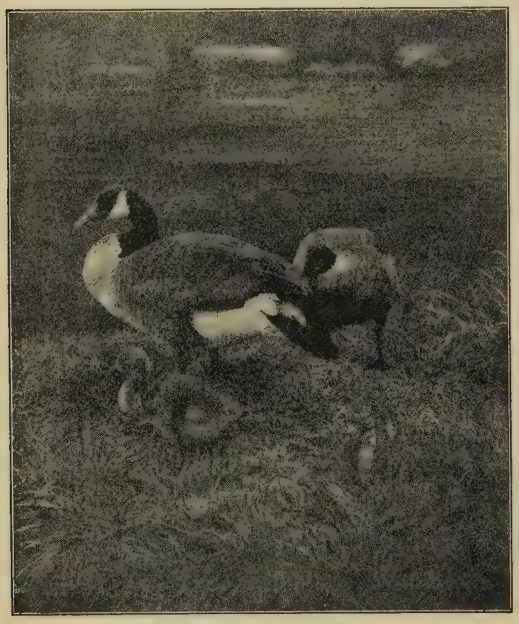
Nearly all sportsmen admire this duck, and it is much to be regretted that it is so shy and

marked by a striking, black-and-white semicircular crest of great height, standing stiffly erect, and jaunty beyond compare amongst water-fowl. By that crest and the slender Merganser bill any one may know this bird out of ten thousand species, whether seen in New York or New Zealand. It ranges all over North America, wherever there is water enough to float it, down to Mexico and Cuba, and as a result has been burdened with an appalling

[1] *Lo-phod'y-tes cu-cul-la'tus.* Average length, 17 inches.

collection of names. It nests in hollow trees, near good fishing-grounds, and whenever it makes its summer camp near a trout stream, the fry fare badly.

The Geese.—Those who have not looked into the subject usually are surprised to find what a fine collection of geese is found in North America. The continent is so large it requires an effort to come in touch with representatives of all the species of wild-geese which inhabit it. While they are somewhat lacking in the fine coloring that characterizes a few foreign species, such as the spur-winged goose of Africa,



CANADA GOOSE.

they form, as a whole, a highly interesting group, well worth the acquaintance of all Americans save the market-hunters, and others who shoot not wisely but too well.

Fortunately for those who live where wild-geese dare not show themselves for fear of being killed, all these species take kindly to captivity, and are easily kept in parks and zoological gardens. In 1903, five species were living quite contentedly in the New York Zoological Park.

In writing of geese, we would not think of mentioning any species ahead of our old favorite and most faithful friend, the **Canada Goose.**[1] Where is the country dweller who has not heard, far aloft, the well-known trumpet "Honk," and the prompt answers all down the two lines as the V-shaped flock winged swiftly forward? In the raw, windy days at winter's end, from the Gulf to Hudson Bay, the old gander's cry is accepted as a guarantee of spring, and hailed with joy. Dull indeed is the mind that is not moved to wonder and admiration by the remarkable V-formation in which the wild-goose flock cleaves the air.

Although wild-geese in transit through the Mississippi valley frequently alighted in cornfields to rest and feed, as a rule they were so wary and wide-awake it was next to impossible to bag one. In Minnesota and the Dakotas, however, they often flocked on the ground in such numbers that goose-shooting was as regular a sport as chicken-shooting, and during a brief period of slaughter yielded weighty results. Thousands of geese alighting in cornfields to feed have been shot from the interior of innocent-looking corn-shocks.

The Canada Goose is not only the largest of the wild-geese of North America, but also the most important and valuable member of the group. There are times, also, when it seems to be the most savory bird that finds its way to the platter. One of those times was when a flock alighted near our camp, on the ice of the Musselshell, in Montana, the day before a certain whizzing cold Thanksgiving, and a fat young gander was shot, and beautifully roasted over the camp-fire in a large Dutch oven.

In captivity the Canada Goose is an all-around philosopher; and even when wild, he often knows a good thing when he sees it. In October, 1901, a flock of nine geese flying southward over the New York Zoological Park suddenly espied our flock of the same species on the Aquatic Mammals' Pond. Without a moment's hesitation, the wild-birds sailed down and alighted on the shore beside their relatives, and invited themselves to the banquet of cracked corn.

On the following day, Mr. H. R. Mitchell coaxed seven of the visitors into a huge wire cage that was set up on the shore, where they

[1] *Bran'ta canadensis.* Average length, about 35 inches; but individuals vary greatly in size.

were caught and wing-clipped to prevent further wandering into danger. The seven are still there; but the two unclipped birds, after remaining all winter, flew away north the following spring, and it is quite likely that their bad judgment has ere now cost them their lives.

Apparently, all the North American geese are almost as easy to keep in captivity as domestic geese. Their favorite food is cracked corn and whole wheat, but they will eat almost any kind of grain. In winter they require low shelter coops, open toward the south; and a small portion of their pond must be kept open all winter, by frequently removing the ice, to keep their feet from freezing. Not all these birds, however, care to seek shelter in a humble coop.

The Canada Goose is known by its large size, and its jet-black head and neck, with a conspicuous white crescent encircling the throat. The black on the neck ends abruptly where the neck joins the body, and the general tone of the latter is gray-brown. Its neck is longer, and also more slender as a rule, than those of other birds.

This fine bird winters in Texas, along the Gulf of Mexico, and in the sounds and bays of Virginia and the Carolinas, and goes north early in spring. Its nesting-grounds begin in our northern tier of states, and extend northward to Labrador, the Barren Grounds and Alaska. Throughout much of that vast area, the shot-guns and rifles are ever ready, and the number of geese that still survive are eloquent testimony to the wariness, the keeness of vision and the good judgment of this much-prized bird. A bird of equal desirability, but with a dull brain and poor vision, would have been exterminated long ago.

One of the most interesting things about the Canada Goose is the energy and courage of the male in defending the female on her nest. Last spring two of our geese paired off, and built a nest on the south bank of the Mammals' Pond, in a very exposed situation. From that time until the young were hatched, the gander never once wandered from his post. It was his rule never to go more than sixty feet from the nest, and whenever any one approached it, he immediately hastened to intercept the intruder, hissing and threatening with his wings in a most truculent manner. Had any one persisted in disturbing the female, he would willingly, even cheerfully, have shed his blood in her defence. His unswerving devotion to his duty attracted the admiring attention of thousands of visitors, and the proudest day of his life was when the first live gosling was led to the water, and launched with appropriate ceremonies.

There are three subspecies of the Canada Goose, all smaller, but otherwise very similar. The **White-Cheeked Goose** inhabits the Pacific coast, north to Sitka; and the **Cackling Goose** is found in the same region, and on up to the Yukon. **Hutchin's Goose** is merely a small edition of the Canada.

The Black Brant[1] is a very distinct bird, noticeably smaller than the Canada goose, and readily recognized by its blackness and its small size. Its head, neck, and breast are entirely black, save for a white collar going two-thirds of the way around the upper neck. The black of the neck does not end abruptly at the shoulders, but spreads back over the back and under parts until the final effect is that of a bird which is two-thirds black.

Although this bird is generally accounted rare on the Atlantic coast, the New York Zoological Society has secured a number of fine living specimens from Carrituck Sound, on the coast of North Carolina. Beyond doubt, however, it is rare everywhere in the eastern United States. It is remarkable for the fact that it migrates northward not only to the desolate shores of the Arctic Ocean, but far beyond, and must nest and rear its young far out on the great polar ice-pack.

The Brant Goose[2] is quite a different species from the preceding. The black of its neck ends abruptly at the shoulders, and the white collar is a mere broken patch, without decided character. The body is everywhere much lighter than the color of the black brant, with which this species is often confounded, because the two are often found together, though not on the Pacific coast. Once the Brant Goose was plentiful along the Atlantic side, but it is now rare, and fast disappearing.

[1] *Bran'ta ni'gri-cans.* Average length, about 24 inches.

[2] *Bran'ta ber'ni-cla.*

The American White-Fronted Goose[1] is, in my opinion, the most handsomely colored goose we possess. Contrary to expectations that are often based upon its name, it has not a white breast, nor white shoulders. Its white "front" is limited to an inch-wide frill of white immediately surrounding *the base of its bill.* Other than this the head and the neck are dark brown, and the back, sides, breast and abdomen are covered with a scale-like arrangement of feathers that are various shades of brown or black, strongly edged with white or gray. The effect of the white edges of the feathers is to bring out in strong relief the immaculate arrangement of the plumage, and as a whole the bird is decidedly beautiful.

This fine bird is even yet abundant on the Pacific coast, from southern California to Alaska, where it crosses over to the Asiatic side. It appears that Alaska is its favorite nesting-ground. On the Atlantic coast it is no longer seen. The specimens living in the Zoological Park were taken in southern Texas, on the Rio Grande, where the species is yet a winter visitant.

New York Zoological Park.

TRUMPETER SWANS.

The Snow-Goose[2] is, excepting its large wing-feathers (the primaries), an all-white bird. Based on the tape-line, two species have been

[1] *An'ser al'bi-frons gam'bel-i.* Average length, 28 inches.

[2] *Chen hy-per-bo're-a.* Average length, about 30 inches.

described and recognized by ornithologists, the "Greater" Snow-Goose, and the "Lesser." If the specimen under the tape is a large one, it is the former species; but if it is smaller than the average, it is booked as the "Lesser." Obviously, the wisest course is to discard both adjectives of size, and recognize the Snow-Goose only, be it more or less.

This easily recognized bird, like the majority of our other wild geese and ducks, wanders over almost the whole of the well-watered portion of North America down to Cuba and Mexico; but where the guns of civilization are most numerous it is now a rare and lonesome bird. To-day it is more abundant—or it were better to say, *less scarce*—in the Mississippi valley, Texas, and the Pacific states than elsewhere. Where they were permitted to do so, these birds often assembled in large flocks, and often made themselves conspicuous around the prairie-ponds of the Dakotas and Minnesota. When you are travelling over the Northern Pacific Railway, or the Great Northern, and see on the smooth prairie a flock of rather large white birds, it is safe to declare that they are Snow-Geese.

The Swans.—Last of the Order of Ducks, and farthest from the type of the Order, are the Swans. Although two species are recognized, the difference between them is not always visible to the naked eye.

The Trumpeter Swan[1] is one of our largest birds, and considering its great size it is strange that it has not been exterminated ere this. Its existence speaks highly for its wariness. Living specimens are purchasable at from $20 to $30 each, and the majority of them come from Texas and the plains region. To my mind, this is the least attractive of all the large swimming-birds, and it certainly is one of the most pugnacious and quarrelsome. In captivity, Trumpeter Swans always wish to do the wrong thing. Even when policy demands that they at least appear friendly, they are always truculently hissing at and threatening their human neighbors, friends as well as enemies. This Swan's voice is like a short blast on a French horn, but when a large flock rises from a pond in a wilderness, and gets fairly under way, the chorus given forth on such occasions I know to be decidedly musical, and also heart-breaking when out of range.

With birds smaller than themselves, Swans often are so quarrelsome and murderous they require to be separated, and yarded by themselves.

On level ground, the Swan is the most ungainly of all the American members of the Order of Ducks; and even afloat, its bows lie much too deep in the water.

The central line of migration and distribution of this species is the western boundary of the states forming the western bank of the Mississippi. It breeds from Iowa northward to the Barren Grounds, and in the United States straggles eastward and westward to both shores of the continent. I have seen specimens taken in 1885 in the Potomac River, and it has often been observed near Los Angeles, southern California.

Thus far, only one naturalist (so far as we know) ever has heard the "Song of the Dying Swan." Mr. D. G. Elliot, in "Wild Fowl of North America," records the following interesting observation:

"Once, when shooting in Carrituck Sound, . . . a number of Swan passed over us at a considerable height. We fired at them, and one splendid bird was mortally hurt. On receiving his wound the wings became fixed, and he commenced at once his song, which was continued until the water was reached, nearly half a mile away. I am perfectly familiar with every note a Swan is accustomed to utter, but never before nor since have I heard any like those sung by this stricken bird. Most plaintive in character, and musical in tone, it sounded at times like the soft running of the notes in an octave."

The Whistling Swan[2] is accorded rank as a species chiefly on the strength of a small yellow patch on the base of the bill—which is not always present! Young Swans of both species are of a dirty-gray color—not white; but the plumage of the adult bird is perfectly white. The bill and feet are jet black.

[1] *O'lor buc-cin-a'tor.* Length, 4 feet 8 inches; height, when standing erect, 3 feet 9 inches; expanse of wings, 7 feet 10 inches; weight, 22 pounds.

[2] *O'lor co-lum-bi-an'us.*

CHAPTER XXIX

THE ORDER OF FULLY WEB-FOOTED BIRDS

STEGANOPODES

To recognize a member of this Order, look at its foot, and see that the web of the three large toes *is also united to the fourth, or rear toe.* This may seem like a small peg on which to hang an Order; but it is a very useful one, nevertheless. As usual, the best and most conspicuous example will be mentioned first. The Families are as follows:

	FAMILIES.		EXAMPLES.
ORDER STEGANOPODES.	PELICANS, . . .	*PEL-E-CAN'I-DAE*, ...	Brown Pelican; White Pelican.
	CORMORANTS, . .	*PHAL-A-CRO-CO-RAC'I-DAE*, .	Common Cormorant.
	DARTERS, . . .	*AN-HING'I-DAE*, ...	Darter, or Snake-Bird.
	GANNETS, . . .	*SU'LI-DAE*, ...	Common Gannet.
	MAN-O'-WAR BIRDS,	*FRE-GAT'I-DAE*, ...	Frigate-Bird.

Photographed by C. WILLIAM BEEBE. From the *Zoological Society Bulletin.*

FLORIDA BROWN PELICANS, ON PELICAN ISLAND.

THE PELICAN FAMILY.

Pelecanidae.

The Brown Pelican[1] is known to every tourist who knows Florida thoroughly, or southern California. Somehow this bird appeals to every one,—possibly by reason of its cheerful confidence in man,—and for a wonder it has not been exterminated. It takes to captivity not only willingly, but gladly, and its motto is, "All's fish that cometh to net."

[1] *Pel-e-ca'nus fus'cus.* Length, 49 inches; spread of wings, 6 feet 9½ inches.

It is an amiable bird, sociable to an unlimited degree, harms no one, and makes no enemies.

Pelican Island, in Indian River, Brevard County, Florida, is the most interesting sight in the land of flowers. On an area of about three acres, raised only two or three feet above high-water mark, destitute of trees because the Pelicans have nested them to death, live about 2,000 Brown Pelicans, and in 1902 they made 976 nests. During every breeding-season they

Photographed by R. J. Beck. Galapagos Islands.

CALIFORNIA BROWN PELICAN.

inhabit that islet, nesting in small nests of grass plucked on the spot, and arranged on the ground. The few dead mangroves that still stand are loaded with stick-made nests, to the point of breaking down.

Egg-laying begins about the first of February, and straggles along until the end of May. By March 15, the breeding-grounds contain in close proximity, unfinished nests, and nests with fresh eggs (usually three); young just out of the shell; half-grown young, and, finally, full-grown young. The latter are great hulking babies, as large as their parents, but covered all over with down as white as cotton.

It is no uncommon thing for a young Pelican to have from six to nine mullet in its neck and crop at one time, as we have discovered by catching some of them with a search-warrant, and searching their premises.

To feed these hungry and appallingly capacious pouches, the old birds fly about fifteen miles up the coast to fishing-grounds where silver mullet are plentiful and cheap; and there each old bird fills its neck and crop with from six to nine fish, each from seven to ten inches in length. At evening, just before sunset, in groups of from three to seven they slowly wing their way back along the beach, flying low over the saw palmettos that fringe the shore. They give about six wing-beats, then sail as far as possible, each little company winging in unison. Several times I have lain low in the palmettos, to watch their flight at a distance of only a few feet as they approached and passed over me.

Truly they are fine birds,—rich in coloring, remarkably odd in form, and very well set up. Unfortunately they do not acquire their full colors until in their third year. The neck of the adult bird is in two colors, rich blackish-brown and white, and the back is a beautiful silvery gray-brown effect, composed of many tints. The top of the head of the adult bird is yellow. The bill is a foot long, the pouch is of a bluish-purple

New York Zoological Park.

GREAT WHITE PELICAN.

color, and calls for about four pounds of fish daily.

It is very interesting to watch Pelicans fishing. On calm days when the surface of Indian River is like a mirror, the eruption of silvery spray that rises high when the big bird plunges into the water, attracts attention at a distance of two or three miles. It is finest, however, to see them fishing in the breakers on the ocean side of the Indian River Peninsula, about 200 feet from shore. They sail along so near the water it seems a wonder it does not strike them; but they rise over the incoming waves, and lower again into the trough with the utmost precision, always keenly alert. All of a sudden, the wings are thrown out of gear, and a fountain of flying spray tells the story of the plunge with open pouch for the luckless fish.

For several years the fate of the great Pelican colony in Indian River has been in doubt, and its preservation has been due more to public sentiment in Brevard County than to the arm of the law. In 1903, however, Pelican Island was formally declared to be a government reservation, and placed under the absolute control of the Biological Survey, thus insuring the permanent protection of its occupants.

The California Brown Pelican[1] so closely resembles the Florida species that the differences between the two are not easily recognized. The accompanying illustration is from a photograph taken on the Galapagos Islands, directly under the equator; and from that locality this species ranges northward along the Pacific coast to British Columbia.

The Great White Pelican[2] is a grand bird,—big, clean, immaculate, and with the dignity of a newly appointed judge. About him there are two bad things. In captivity his appetite for fresh fish makes him a costly luxury, and his Latin name always frightens timid people.

The curious horn seen in winter and spring atop of the bill of this bird is purely a sexual ornament, found only on the male in the breeding-season, after which it drops off. It begins to grow about February 15, is perfect by May 1, and drops off not later than July 1.

To-day, as a matter of course, the Great White Pelican is a rare bird. On the west coast of Florida, where once it was abundant, I believe it is no longer found. It is yet found inland in certain western localities, where there are lakes large enough to shelter it, and supply it with fish, and it is to be hoped that it will be many years ere this grand bird is exterminated. Fortunately, a colony has become established on an island in Yellowstone Lake, in the Yellowstone Park, where it breeds regularly every summer, to the great delight

[1] *Pel-e-ca'nus californicus.*

[2] *Pel-e-ca'nus. er-yth-ro-rhyn'chos.* Length, 61 inches; spread of wings, 8 feet 10 inches; weight, 16½ pounds.

of all tourists who care for the sight of what is called a "pelicanery." In winter, southern Texas is the haven for this bird, as well as for so many other swimming-birds.

THE CORMORANT FAMILY.

Phalacrocoracidae.

The Cormorant[1] is to me a most uninteresting bird. Month in and month out I have seen them perching, and perching,—on spar buoys in harbors, on mud-bank stakes, and on dead trees along shore and up stream. For days together have Cormorants fled up stream before my boat, yet never once have I seen a wild Cormorant do an interesting thing. Instead of getting out and hustling for fish, like the pelican, or taking delight in architecture, like the osprey, the Cormorant tiresomely perches, and waits, Micawber-like, for something to turn up.

In captivity it does better. In our Flying-Cage pool, the Cormorants play with sticks, and dive for amusement, more than any other bird, except the brown pelican. In fact, it seems like a different creature from the wild bird.

The Cormorant is, in general terms, a dull black bird, wholly devoid of colored plumage. Its range is given in the check list of the American Ornithologists' Union as "coasts of the North Atlantic, south in winter on the coast of the United States, casually, to the Carolinas." It lives upon fish, and wanders inland much farther than might be supposed.

The Double-Crested Cormorant[2] is the bird of the interior of the United States, from Texas northward into Manitoba, but also ranging to the Atlantic coast. Its color is glossy black. On the Pacific coast, from Washington to Alaska, is found the **Pelagic Cormorant,**[3] with an erect crest rising from its forehead, and by which this bird is easily recognized.

Pallas' Cormorant, which once inhabited the northern shore of Bering Sea, was the largest and handsomest bird of this Family. Its prevailing color was dark metallic-green, set off with blue and purple reflections. It was discovered by Bering in 1741, but is now quite extinct.

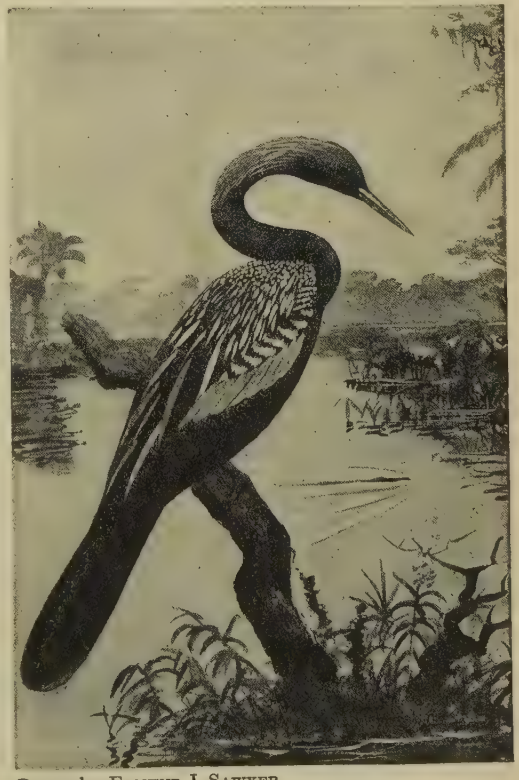
[1] *Phal-a-cro-co'rax car'bo.* Average length, 34 inches.
[2] *P. di-lo'phus.* [3] *P. pe-lag'i-cus.*

THE DARTER FAMILY.

Anhingidae.

The Snake-Bird, Darter, or **Water-"Turkey,"**[4] is a web-footed bird, with many peculiarities. Its most popular name—Snake-Bird—has been bestowed in recognition of the fact that in this bird the neck and head are so long and slender they suggest the body and head of a snake. When not in action, the head and upper neck are only an inch in diameter, yet so rubber-like is the skin I have seen a Darter swallow a mullet 8 inches long, and 1½ inch in diameter—a truly snake-like stretch. Frequently when the head of a fish is in this bird's crop, the tail fin will protrude from a corner of the mouth.

The beak is like a Spanish dagger, and at all times is decidedly a dangerous weapon. One well-aimed stroke is enough to stab any ordinary bird to death, or destroy an eye. In a cageful of Darters the presence of a quarrel-



Drawn by EDMUND J. SAWYER.

SNAKE-BIRD.

[4] *An-hin'ga an-hin'ga.* Average length, 33 inches

some bird is usually made known by the dead body of a cagemate that has been foully murdered.

In its home, the habits of the Snake-Bird interested me greatly. Almost invariably it perches on a dead tree, or a branch which overhangs water, preferably a small running stream. Its neighbors are the two white egrets, the Louisiana and little blue herons, and an occasional black vulture. Seldom indeed is one of these birds found swimming in the water, but Mr. C. E. Jackson once very dexterously speared one from his boat, as it was diving under him.

When your boat approaches a Snake-Bird and crosses his danger-line, the bird slides off its perch, falls straight down, and sinks out of sight. It goes down head erect, and "all standing," as if weighted with a bag of shot. This is the queerest of all bird ways in diving. If you halt, and watch sharply for the bird to reappear at the surface, for three or four minutes you will see nothing.

At the end of a long wait you will notice a sharp-pointed stick, half as long as an adult lead-pencil, sticking up out of the water. It looks so queer you watch it sharply. Presently you see the point of it turn a few degrees; and then you discover a beady black eye watching you. It is one of the neatest hiding-tricks practised by any water-bird I know.

The Snake-Bird has the power to submerge its body at any depth it chooses, and remain for any reasonable length of time. It is a very expert diver, and the manner in which it can pursue and capture live fish under water is enough to strike terror to the hearts of finny folk. The bird swims with a sharp kink in its neck, driving forward by powerful strokes of its cup-shaped feet. On overtaking a fish, the kink in its neck flies straight, and like the stab of a swift dagger the finny victim is transfixed. Then the bird rises to the surface,—for it is unable to swallow its food under water,—tosses the fish into the air, catches it head first, and in an instant it is gone.

In the United States this bird is most at home in the rivers and creeks of southern and central Florida, but it is also found farther west, along the Gulf. It is abundant in the delta of the Orinoco, in the Guianas, and farther south. It lives well in captivity, and when provided with a large glass tank is quite willing to give daily exhibitions in diving after live fish. In color the adult male is a glossy black bird, and so is the female, except that her entire neck is light brown.

THE GANNET FAMILY.

Sulidae

The Common Gannet[1] is, in many respects, a bird of very striking appearance. It is a goose-like bird, as large as a medium-sized goose, and its prevailing colors are white and a very beautiful ecru. Its plumage is as smooth and immaculate as the surface of a wooden decoy; it has a slow and solemn manner, and has the least suspicion of man of any swimming bird I know. Its head, neck and bill are massive, the latter especiallly being long and very thick at the base. The total length of this bird when adult is only a trifle under three feet.

Although the Common Gannet is strictly a bird of the ocean coasts, and apparently never is seen inland, it is a bird of such striking personality it well deserves to be introduced in these pages. Any large bird which once existed in countless thousands on our coast, and has not yet been exterminated, may well be known to every intelligent American.

Although the Gannet wanders as far south as Long Island, its real home is where it breeds. "While there are many points along the coast from Maine to Labrador where the Gannets might breed, they are found, so far as I have been able to ascertain, only at three places, an island in the Bay of Fundy, the Bird Rocks near the geographical centre of the Gulf of St. Lawrence, and Bonaventure Island, at Percé, Canada, the colony at Mingan being too small and too nearly exterminated to be taken into consideration." (Frederic A. Lucas.)

In 1860, Dr. Bryant estimated the total number of Gannets on the Bird Rocks at 150,000.

In 1872, Mr. William Brewster estimated the number then living there at 50,000.

In 1887, Mr. Lucas found not a single Gannet nesting on Little Bird Rock, and not over 10,000 on Great Rock.

Although the Gannets, and other sea-birds, make their homes on the most inaccessible

[1] *Su'la bas-sa'na.*

THE CORMORANT.

spots they can find, there is no bird which man cannot reach with a gun, no nest to which he cannot climb, or be lowered at the end of a rope.

Sea-birds everywhere are persecuted by man, either for their eggs or for themselves. In their breeding-season the Gannets are continually visited by Indians and whites, who take their eggs. "Scarce a day passes," says Mr. Lucas, "without a visit from fishermen in search of eggs, or murres. Many barrels of eggs are gathered during the season, and altogether the birds lead a rather precarious existence. There is a law regulating the taking of eggs, and if this were observed, or could be strictly enforced, a large number of eggs could be gathered annually, while at the same time the number of birds would steadily increase."

As will be inferred, the Gannet lives wholly upon fish, and is an expert deep-water diver. In his report on his "Explorations in Newfoundland and Labrador," Mr. Lucas gives the following interesting account:

"While lying at Grindstone Island we first made the acquaintance of the Gannets, whose head-quarters are at Bird Rocks, and had a good opportunity to watch them fishing. The birds are usually associated in small, straggling flocks, and with outstretched necks, and eyes ever on the lookout for fish, they fly at a height of from 75 to 100 feet above the water, or occasionally somewhat more. The height at which the Gannet flies above the water is proportioned to the depth at which the fish are swimming beneath, and Captain Collins tells me that when fish are swimming near the surface, the Gannet flies very low, and darts obliquely instead of vertically upon its prey.

"Should any finny game be seen within range, down goes the Gannet headlong, the nearly closed wings being used to guide the living arrow in its downward flight. Just above the surface, the wings are firmly closed, and a small splash of spray shows where the winged fisher cleaves the water to transfix his prey. Disappearing for a few seconds, the bird reappears, rests for a moment on the water, long enough to swallow his catch, then rises in pursuit of other game. The appetite of the Gannet is limited only by the capacity of its stomach, and a successful fisher may frequently be seen resting on the water, too heavily laden to rise without disgorging a part of its cargo, which it sometimes must do to escape from the pathway of an approaching vessel."

Any person who is accustomed to diving, even from a very moderate height, knows well the serious disturbance to vision caused by the shock of impact with the water. That a Gannet—or any other bird—can fall from even a height of twenty-five feet, saying nothing of a hundred, take the water plunge, and *retain its gaze* upon its prey sufficiently to follow and capture it, surely betokens a special optical provision which as yet we know nothing about.

Photo. by R. J. Beck. Galapagos Islands.

MAN-O'-WAR BIRDS.

and which remains to be discovered and described.

Besides the species described above, there are five other species of gannets, called **Boobys,** with various prefixes, which touch the coasts of the continent of North America.

THE MAN-O'-WAR BIRD FAMILY.

Fregatidae.

Whenever at sea in the tropics your attention is arrested by the flight far aloft of a big, dark-colored bird with long, sharp-pointed wings, and a *long tail* that is *deeply forked,* know that it is a **Frigate-Bird,**[1] or, as the sailors call it,

[1] *Fre-ga'ta a'quil-a.* Length, about 40 inches.

Man-o'-War "Hawk." It is a long-distance flyer, and goes out far from land. Its beak is long, hooked at the end, and really very strong, but its legs are so short and stumpy they seem to be deformed. Under the throat there is a patch of skin quite devoid of feathers, which really is a sort of air-sac.

I once found the roosting-place of a colony of about forty of these birds, on the top of a perpendicular cliff seventy-five feet high on the seaward side of an island at the northwestern point of Trinidad. The birds came there regularly every night, to roost in some small dead trees that almost overhung the precipices. They were not nesting at that time, however, and were so very wakeful that even though I went to their roost before daylight, I did not succeed in killing even one bird.

This bird inhabits the warm oceans of the Old World, as well as the New, and Mr. H. O. Forbes states that in the Cocos-Keeling Islands they are regular pirates, and gain their livelihood by remaining inactive, and forcing honest fisherfolk, like the gannets, and noddy terns, to disgorge for their lazy benefit the fish they bring home from distant fishing-grounds.

Mr. R. J. Beck found Frigate-Birds nesting in the Guadaloupe Archipelago, which were so tame and unsuspicious that he was able to approach quite near, and make the photograph which is reproduced on the opposite page.

CHAPTER XXX

THE ORDER OF TUBE-NOSED SWIMMERS,—MID-OCEAN BIRDS

TUBINARES

These are indeed strange birds. To a landsman, it requires an effort to imagine a series of birds, some of them small and seemingly weak, which prefer to live in the watery solitudes of mid-ocean, indifferent to calms, and defying both tempests and cold. To my mind, there is no section of the bird-world so strange and so awe-inspiring as this. Just how the albatrosses and the petrels ride out the long, fierce gales, and keep from being beaten down to the raging surface of the sea, and drowned, I believe no one can say. It is no wonder that sailors hold the albatross in superstitious reverence, or that Coleridge has immortalized it in the "Rhime of the Ancient Mariner." Well may a sailor feel that any large bird which lives only at sea, and follows his ship day after day, is the bird "that makes the breezes blow."

The members of this small group of mid-ocean birds are distinguished by the curious fact that the nostrils, instead of opening through the side of the upper mandible, near its base, are *carried well forward through two round tubes* that either lie along the top of the bill or along its sides. By this arrangement, the nostril opening is about half way between the base and tip of the bill. The bill terminates in a strong, serviceable hook, like the beak of a bird of prey.

This Order consists of the albatrosses, fulmars, shearwaters and petrels,—all of them deep-water birds, strong of wing, and brave spirited beyond all other birds. Of the thirty-five species and subspecies recognized by the American Ornithologists' Union, only two or three ever wander to inland lakes, even for three hundred miles from salt water. The variation in size from the largest albatross to the smallest petrel is very great; but at least half the species of the Order are to be classed as large birds. Three species will suffice to represent the group.

THE ALBATROSS FAMILY.

Diomedeidae.

The Wandering Albatross[1] is a bird of the southern oceans of the New World; it is the largest and handsomest species in the Order *Tubinares*. It has the longest wings, but the narrowest for their length, and the greatest number of secondary feathers (over thirty in number) of any living bird. The weight of an adult bird is from 15 to 18 pounds, and when the wings are fully extended, they have a spread of from 10 to 12 feet. Either when on the wing at sea, or mounted with spread wings as a museum exhibit, the wings of an Albatross are so exceedingly long and narrow that they have a very odd and unfinished appearance. They seem to be out of proper proportion, like wings lacking a proper outfit of secondary feathers. But they have their purpose. The Albatross can sail for hours, to and fro, without resting, and with wings so motionless they might as well be mechanically fixed.

Mr. Charles H. Townsend, who, as Naturalist of the United States Fish Commission Steamer *Albatross*, has had exceptional opportunities for studying Albatrosses at sea in all kinds of weather, has kindly furnished the following account of the most conspicuous species that inhabits the North Pacific:

"The Black-Footed Albatross[2] is a common bird almost anywhere in the Pacific Ocean, from the latitude of California northward. This dark species is frequently seen the first day

[1] *Di-o-me'de-a ex'u-lans.*
[2] *Di-o-me'de-a ni'gri-pes.*

out, and can usually be depended upon to follow vessels in increasing numbers. On many voyages between San Francisco and the Aleutian Islands, the average attendance of Albatrosses, or '*Gonies*,' as they are usually called, was from fifteen to twenty. Whether the same individuals stayed with the vessel during the whole flock of birds would alight upon the water, often coming close enough to be caught on cod-hooks baited with pork. When on the wing, sometimes all the birds would assemble at once to feed on the waste thrown overboard from the galley, alighting in a confused manner, with much squawking and fluttering of wings.

BLACK-FOOTED ALBATROSS.

run, or were replaced from time to time by other birds encountered along the way, we could not determine.

"The birds were with us from daylight to dark, and in all sorts of weather. The S. S. *Albatross*, being engaged in deep-sea investigations, made frequent stops for the purpose of sounding and dredging. At such times the

"We often hooked specimens while the ship was under way, by paying out the line rapidly enough to leave the bait lying motionless, and buoyed on the surface with a cork. The birds were not able to pick up a bait while on the wing, or while it was moving. When hooked they would set their wings rigidly at an angle, and a rapid hauling-in of the long line would

send a bird skyward like a kite, which position it would retain until hauled down on the deck.

"Fishing for 'Gonies' was a common amusement on the *Albatross*, and specimens were often photographed alive on the decks, or marked in some way to determine if possible whether the same individuals followed the vessel throughout the voyage. Marked birds, however, never were seen again. The handling which they received probably disinclined them to follow the vessel.

"The arrival of an Albatross on deck was usually followed by the disgorging of more or less food. They could not rise from the deck, and frequently were kept on board for several days. They walk with great difficulty, and bite savagely.

"Albatrosses rise easily from the sea, and when the wind is blowing it is done very quickly. In calm weather, several strokes of the wings, and a rapid movement of the feet are necessary for the bird to clear the water. No bird can exceed the Albatross in the gracefulness of its flight. Usually following in the wake, it has, however, no difficulty in passing ahead of the vessel, always on rigid, motionless wings, rising, descending, or turning without a wing movement that is visible to the eye.

"On voyages southwestward from California, the Black-Footed Albatross did not usually follow the vessel more than two-thirds of the way to the Hawaiian Islands. A species known as *Diomedea chinensis* breeds in great numbers on the chain of islands extending northwestward from Hawaii. So far as I am aware, the breeding-place of *Diomedea nigripes* is not known. It probably breeds during the winter months on islands in the southern hemisphere. It is sometimes found in Bering Sea, particularly in the Bristol Bay region, and is met with all summer long in the Pacific south of the Aleutian Islands. During many visits to the Aleutian and other American islands, it was never found on land, and the natives were not acquainted with it as a nesting bird.

"In Bering Sea we sometimes met with the **Short-Tailed Albatross** (*Diomedea albatrus*). This species is nearly white, and in calm weather was usually observed resting on the sea, near the great flocks of fulmars. While the steamship *Albatross* was dredging off the southern coast of Chili, the great wandering albatross was frequently to be seen resting upon the water about the vessel, and we had no difficulty in taking specimens with hook and line."

Perhaps the most wonderful sight in Albatross life is to be found on Laysan Island, in the Pacific Ocean, where thousands of these birds nest close together on an open plain. There are acres and acres of living Albatrosses, stretching away as far as the camera can include them, until the plain is white with them. They manifest little fear of man, even when iron rails are laid down, and small iron box-cars are pushed over them, to load with eggs from the nests.

Drawn by J. Carter Beard.

STORMY PETREL.

THE FULMAR FAMILY.

Procellariidae.

The Fulmars are like so many understudies of the Albatrosses; and the **Shearwaters** bring the Tube-Nosed group still nearer to the gulls and terns. The habits of all these are very much alike. All are strong-flying, mid-ocean birds, following ships for miles in order to pick up whatever edible food is thrown overboard. In one respect they are marine vultures, for some of the species make haste to feed upon any dead animal found floating on the sea, or stranded on the shore.

No one with eyes ever need cross the Atlantic

without seeing the dear little **Stormy Petrel,**[1] or **"Mother Carey's Chicken,"** as it is called by sailormen. After the last gull has been left far behind, and there are about two miles of water under the ship, in the trough between two waves there suddenly glides into view a pair of small black wings, fluttering rapidly, while two little webbed feet work violently to pat the concave surface of the deep blue water. Those who do not know the creature exclaim in surprise, "What in the world is *that?*"

"That" is one of the wonders of the ocean world. The cause for surprise is that so small and weak a creature—the smallest of all the web-footed birds, no larger, and seemingly no stronger than a cat-bird—should live on the watery wastes of a landless ocean, eating, sleeping and enjoying literally "a life on the ocean wave, and a home on the rolling deep."

[1] *Pro-cel-la'ri-a pe-lag'i-ca.* Length, 5.50 inches.

Even when seas are calm, and skies are clear, one cannot easily imagine how this creature can live, and find its food. But when a prolonged storm sets in, and for ten days, or two weeks at a stretch the surface of the sea is a seething, boiling caldron, with every wave a ragged "white-cap" and every square foot of the sea fretted like a fish-net by the force of the wind, how does the frail little Stormy Petrel survive?

You nearly always see this bird in the trough of the sea, skimming so low that its feet can paddle upon the surface of the water, and assist the wings. It is a black bird, with a large white patch on the rump, just above the tail. It rests upon the water fully half its time, I should say, and aside from the table and galley refuse thrown overboard from vessels, the bulk of its food must consist of the tiny crustaceans that inhabit the floating bunches of sargasso weed.

CHAPTER XXXI

THE ORDER OF LONG-WINGED SWIMMERS

LONGIPENNES

The members of the Order of Gulls and Terns appeal to a greater number of admirers than any other group of web-footed birds. The reasons are, their wide distribution, both on salt water and fresh water lakes; their conspicuous and graceful flight; their partial immunity from wholesale slaughter, and their friendliness toward the arch-destroyer, man. Every harbor and every steamer track is a safe feeding-ground for these birds, and along thousands of miles of shore line, they are the most beautiful wild creatures that greet the eye.

The three North American Families of this Order are as follows:

	FAMILIES.		EXAMPLES.
ORDER LONGIPENNES.	GULLS AND TERNS,	*LA'RI-DAE*,	Herring-Gull; Common Tern.
	SKIMMERS,	*RYN-CHOP'I-DAE*,	Black Skimmer.
	SKUAS AND JAEGERS,	*STER-CO-RAR-I'I-DAE*,	Parasitic Jaeger.

THE GULLS AND TERNS.

Laridae.

The Herring-Gull,[1] an old and familiar friend which ranges far inland, and also far outward on the sea, is the best and most interesting type of this Family. It is an ideal Gull,—long-winged, large, white and pearl-gray in color, strong, yet graceful on the wing, a good fighter, and sufficiently plentiful in number to be known to millions of people. It inhabits the whole sea-coast, and all the salt-water bays and inlets of North America, the great lakes, the lakes and ponds of Michigan, Minnesota, Iowa, and several of our larger rivers, such as the Potomac, Mississippi, Missouri and Columbia. From all their regular routes of travel and places of residence, they stray inland for an indefinite number of miles.

The Herring-Gull nests from southern Maine and the great lakes northward to the Arctic Ocean, and makes its winter home in the United States. All trans-Atlantic voyagers have seen it far out at sea, almost half way between Sandy Hook and Queenstown.

In Georgian Bay the sight of Gull life on the crystal-clear waters, and clean, bare islets of pink granite near Owen Sound was one of the most enchanting I ever beheld. Going down Puget Sound on a cold and windy day in November, a large flock of the same old friends followed the steamer for twenty miles, sailing along beside us, sometimes within ten feet of the rail of the hurricane-deck,—a sight which well repaid one for half-freezing in order to see it to the most perfect advantage.

But why wander so far from home to see Gulls? Half a mile from the Zoological Park is the Williamsbridge Reservoir of the New York City water-works. Not long since, curiosity to see if any winter birds were being attracted by that very small but high basin of water, led me to climb up and see. To my great astonishment, I found a distinguished company of sixty-seven Herring-Gulls, standing and sitting in serene contentment on the sheet of ice that covered one-half the surface of the water. It was a nice, quiet, genteel place, well below the sweep of the wind; there was plenty of water for the birds to soak their feet in when the ice made them too cold, and what more could a Gull ask, except a daily delivery of fresh fish?

[1] *La'rus ar-gen-ta'tus.* Average length, 24 inches.

The voice of this Gull is not melodious; and some persons call it harsh and strident. But opinions differ, even on as small a matter as the voice of a Gull. I never yet heard the cry of a wild gull, either on the booming sea-shore, or over the silvery mirror of an inland lake, which was not music to my ears.

In captivity the Gull is badly handicapped. With the primaries of one wing clipped to prevent escape, and without the power of flight, it is not seen at its best; for no Gull is perfect save in flight. Our flock is continuallly shrieking protests against unlawful detention, and with perfect wings every one would quickly fly away, as did those bred in the park and reared to adolescence with perfect wings. We tried to colonize them, but once away they never came back.

In an enclosure which embraced a pond and an island inhabited by about twenty Gulls, twelve Canada geese, and a few other birds, two enterprising Gulls decided to nest and rear a family. Accordingly they built a nest under a bush which stood on a point of the island, in a position that strategically was well chosen for purposes of defence. The two birds made a very wise division of the labor. The female built the nest, laid the eggs and hatched them, and the male did the screaming and fighting that was necessary to protect the family from molestation.

THE HERRING-GULL (1, 2) AND COMMON TERN (3, 4).

Never was there a more bonnie fighter than that male bird. During that whole nesting-period, lasting from April 1 to May 15, he either bluffed or fought to a stand-still everything that came within ten feet of that nest. Before his defiant and terrifying screams, and his threatening beak and wings, no other Gull could stand for a moment. When a Canada goose crossed his dead-line, the Gull would rush at him, seize him by the nearest wing, wing-beat him, and hang on like a bull-dog, regard-

less of being dragged about by the stronger bird, until the goose was glad to purchase peace by retreating. During all these battles, the female sat firmly on her eggs, but pointed her bill at the sky, and screamed encouragement with all the power of her vocal machinery. Eventually the three eggs were hatched, and the young were reared successfully.

On certain islands along the coast of Maine, where Gulls nest in considerable numbers, the Bird Protection Committee of the American Ornithologists' Union, under the leadership of Mr. William Dutcher, has done important and effective work in securing the protection of the birds by the owners of the islands. As if to reward Mr. Dutcher for his labors in their behalf, the Gulls permit him to photograph them on their nests, at very short range. In England, the Zoological Society of London has awarded its medal to several persons for noteworthy services in protecting Gulls from destruction.

The Common Tern,[1] but for the timely interference of the Lacey Law, would ere now have become the very Uncommon Tern. The persons who for years slaughtered birds wholesale and without check for "millinery purposes" would have exterminated this species, at least all along the Atlantic coast.

In an evil hour, some person without compassion, and with no more taste for the eternal fitness of things than a Texas steer, conceived the idea of placing stuffed Terns on women's hats, as "ornaments." Now, unfortunately, woman's one universal weakness lies in the belief that whatever the Fashion Fetish commands that she shall wear, that is necessarily a beautiful thing for her to deck herself withal. As a result, we have seen thousands of angular, dagger-beaked, sharp-winged, dirty-plumaged, rough-looking and distorted Terns, each one a feathered Horror, clamped to the fronts and sides of the hats of women, and worn as head *ornaments!*

Those objects spoke very poorly for their wearers; for since the daughters of Eve first began to wear things on their heads, the Rumpled Tern is the ugliest thing ever devised for head-gear. Thus has been developed a new bird species, which we will christen as above, with *Sterna horrida* as its Latin name. Thanks to the Lacey Law, however, the wearing of stuffed birds has, with fashionable people, quite gone out of fashion, and the only exceptions now seen are on the heads of servants, who, for motives of economy, are wearing the cast-off millinery of their mistresses.

The Tern is much smaller than the herring-gull; it has a very short neck, very long and angular wings, and when on the ground is not a bird of beautiful form. On the wing, however, and especially over the breakers, its appearance is graceful and pleasing. It is a white and gray bird, excepting the black bonnet which covers the upper half of its head and neck; and its bill, feet, and legs are coral red.

Along our Atlantic coast, and especially from Nantucket to Hatteras, it was once a very familiar bird, and its escape from annihilation has been of the narrowest. The Lacey Law, and the anti-bird-millinery laws passed by New York and other states, effectually stopped the sale of wild-birds and their plumage for "millinery purposes," and the Terns are no longer slaughtered as heretofore. In several places where they breed they are now protected, and henceforth should slowly increase in number.

There are now but few localities on our Atlantic coast between New Jersey and Nova Scotia where the Common Tern, or "Sea Swallow," breeds. Two of these are Muskeget Island, northwest of Nantucket, and Gardiner's Island. The once numerous colony that formerly inhabited Gull Island, near the eastern end of Long Island, was broken up and driven off by a "military necessity," no less important than the building of a modern fort to protect the City of New York. By a strange coincidence, it was the 12-inch guns of our coast-defence artillery that drove these much-persecuted birds from one of their favorite nesting-grounds.

THE SKIMMER FAMILY.

Rynchopidae.

The Black Skimmer[2] is a tern in form, but without the spear-like bill of the latter for spearing fish. Its lower mandible is formed for use as a cut-water,—long, thin, rather broad, and flattened *vertically*. The upper mandible is similarly shaped, but is shorter.

[1] *Ster'na hi-run'do.* Average length, 14.50 inches.

[2] *Ryn'chops ni'gra.* Length, about 16 inches.

When seeking food, the Skimmer looks for calm water, and then with most dexterous and well-balanced flight, it slowly wings its way close down to the surface, so low that the lower mandible is actually held *in the water* while the bird is in full flight. Any small edible object that happens to lie on the surface is shot into the mouth, through what is really a very narrow opening.

This is a bird of the tropics, and is much more at home on the coast of British Guiana, among the scarlet ibises, than it is on the coast of the United States anywhere north of Florida. I have never seen it elsewhere than in South America, and on our shores it is a visitor of great rarity.

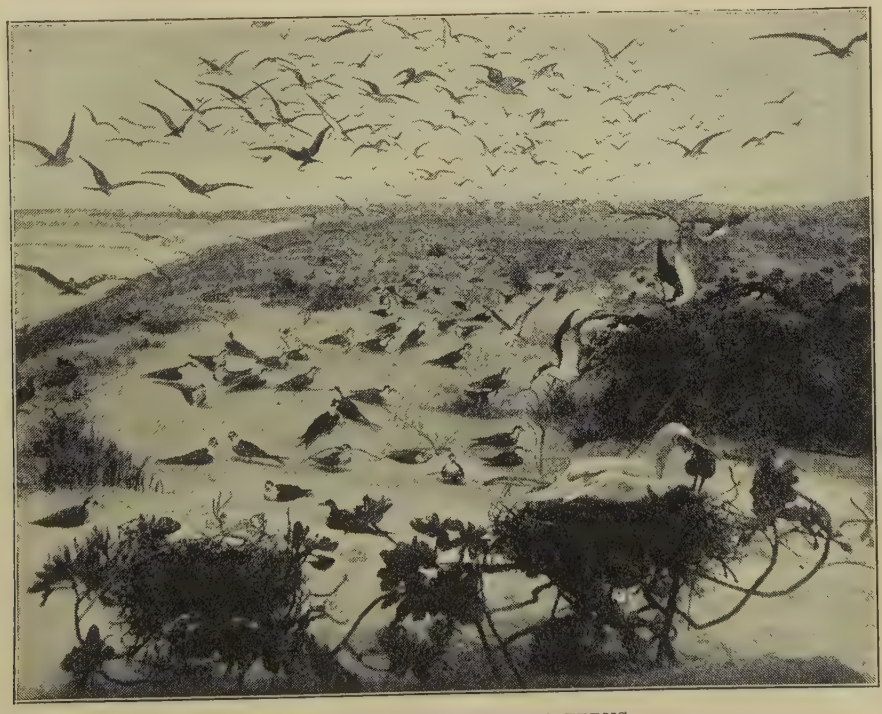
THE SKUA AND JAEGER FAMILY.

Stercorariidae.

The members of this family are habitants of the cold northern seas and high latitudes. They are strong-winged, bold and hardy, and so frequently rob other sea-birds of their prey that they are sometimes called the hawks of the sea. Living examples are rarely seen save by persons who are voyaging northward above the 49th parallel. Of the four species inhabiting North America, the following is the one most frequently seen in the United States:

The Parasitic Jaeger[1] is quoted geographically in the Check-List of the American Ornithologists' Union as follows: "Northern part of northern hemisphere, southward in winter to South Africa and South America. Breeds in high northern districts, and winters from New York and California southward to Brazil." A description of the colors of this bird would be a formidable affair, for both adults and young birds have each two color-phases. The beak of the adult is strongly hooked at the end, like that of a cormorant, but still more pronounced.

[1] *Ster-co-ra'ri-us par-a-sit'i-cus.* Length, about 17 inches.



ROOKERY OF SOOTY-BACKED TERNS.

From a photograph of a section of the great Laysan Island bird group in the Iowa State University Museum of Natural History.

CHAPTER XXXII

THE ORDER OF WEAK-WINGED DIVING-BIRDS

PYGOPODES

With this group, the Class of Birds enters upon a very marked and swift decline from the high types. Another step beyond this Order, and we land among birds so nearly wingless that they are without the power of flight. The birds of the present Order have wings that are small and weak; and while they are able to fly, and also to migrate, they fly feebly in comparison with the cloud-cleaving goose, duck, gull and albatross. Their legs are set far back on their bodies, and on land they have no choice but to stand erect—a posture which is strikingly characteristic of the wingless sea-birds, generally.

This Order, as represented in North America, contains but three Families:

	FAMILIES.		EXAMPLES.
ORDER PYGOPODES.	GREBES, ...	*POD-I-CIP'I-DAE*,	Pied-Billed Grebe.
	LOONS, ...	*GAV-I'I-DAE*. .	Great Northern Diver.
	AUKS AND PUFFINS,	*AL'CI-DAE*, . .	Razor-Billed Auk; Tufted Puffin; Murre.

Of these, the first and second are comparatively well known. The third is composed of birds that are strangers to the great majority of us; but inasmuch as Alaska is constantly being brought nearer to us, it is quite necessary that we should become acquainted with its most prominent forms of bird-life.

The Pied-Billed Grebe, or **"Hell-Diver,"** also called the **Carolina Grebe,**[1] is well qualified to stand as the representative of the Grebe Family, which in North America contains about six species. It is usually seen in the geographical centre of a quiet pond, sharply watching in every direction for enemies. It is a sad and uncomfortable-looking little creature, destitute of bright and pleasing colors, and also devoid of beauty. At a distance, the hunter is thrilled by the sight of what he gladly thinks is a duck; but on approaching nearer he sighs regretfully, and admits that it is "only a Grebe." If he fires at it, in revenge for the disappointment, the bird is gone before the charge of shot is half way to it, and only an innocent ripple marks its disappearance.

All the Grebes are expert long-distance divers. They can either sink straight down, or dart down head first in a fraction of a second, and remain under water so long a time, and wim so far while submerged, that it is very difficult to follow their movements. Sometimes a Grebe will insinuate only its bill above the surface, in order to breathe without exposing even its head and neck. It is a waste of time, ammunition and self-respect to shoot and actually kill one of these birds; for they are very commonplace and useless.

The only redeeming feature about this bird is its breast, which is covered with a thick mass of very persistent feathers, set so tightly in a very tough skin that the evil-eyed milliners once used Grebes' breasts for hat trimmings.

The nesting habits of the Grebe are remarkable and interesting. Instead of choosing a dry situation, where incubation might proceed under the best possible conditions, it frequently chooses a clump of rushes in deep water and builds a floating nest, attached to the rushes. Sometimes, however, it selects a spot where the water is very shallow, and builds from the bottom up, using rushes when possible to procure them. In either case, the sodden mass rises only two or three inches above high-water mark, and

[1] *Pod-i-lym'bus pod'i-ceps.* Average length, 12 inches.

how the eggs ever receive warmth sufficient to hatch them is a mystery.

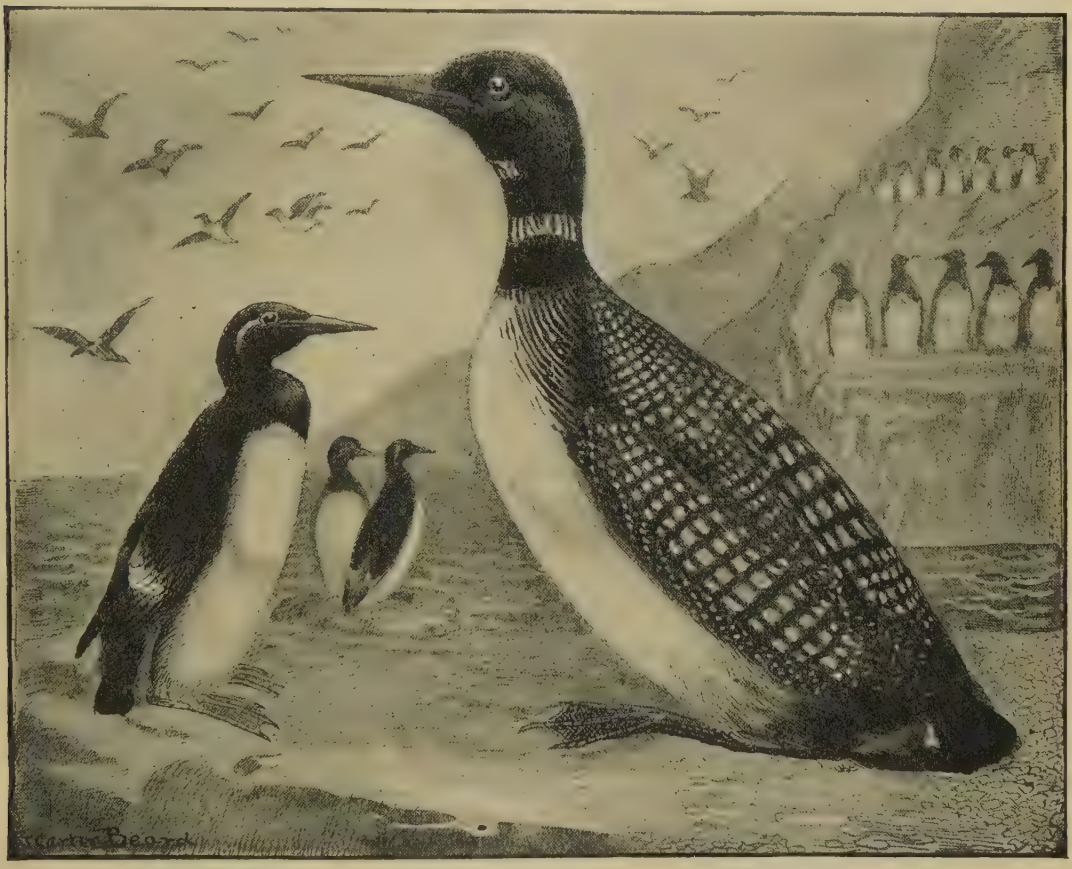
Occasionally a clump of rushes with a floating nest breaks loose from its moorings, and floats away. Some friends of mine once discovered a derelict nest, with the Grebe sitting serenely upon it, floating about in Lake Ontario, whither it had evidently been borne on the current of Johnson's Creek. Doubtless it is a real grief to Grebes that they cannot hatch their eggs under water!

Its prevailing color is brownish-gray, with black throat and chin. Its bill is dull white, with a broad, perpendicular band of black crossing it at the middle, like a rubber band to hold the mandibles together. In size this bird is about as small as a green-winged teal.

THE LOON FAMILY.

Gaviidae.

The Loon, or **Great Northern Diver,**[1] is a large, showy, black-and-white bird, of such striking personality that when once well seen it is not easily forgotten. In bulk it is as large as an ordinary goose, and when standing erect, on land, its height is about 25 inches. Its neck and head are large and jet black, and the upper portion of the former is encircled by a white collar which is formed of upright lines of white



COMMON MURRE. THE LOON.

The Pied-Billed Grebe, also called *Dabchick*, and *Diedipper*, is a Pan-American bird, being found throughout North and South America from Cape Horn to the Mackenzie River, and from the Atlantic to the Pacific. Its phenomenally wide range includes Cuba, several others of the larger islands of the West Indies, and the Bermudas.

[1] *Gav'i-a im'ber.*

dots. The breast is pure white, and the jet-black back is marked by rows of rectangular white dots, or broken bars. The legs join the body far down, near the tail, and when the bird takes to the land, it rests on its feet, the lowest joint of the legs (tarsi), and the tail, which lies flat upon the ground.

Either on land or water, this Loon is a very showy bird, and also a bird possessing many of the mental traits which when combined form what we call "character." Usually it is very wide-awake, suspicious, and difficult to approach; but there are times when it will approach danger as if bent on suicide. Its cry is loud and far-reaching. Sometimes it is like a distressful howl, and again it resembles wild, uncultivated laughter. It is an expert diver and fisher, and in summer is at home all over the upper two-thirds of North America, breeding from our northern states to the Arctic Circle, quite across the continent. In winter it migrates southward to the Gulf and the Mexican boundary.

Its eggs are two in number, of a dull green color. The newly hatched birds are covered with black down, and in travelling the mother-bird often swims with them upon her back. The Loon rises from the water with considerable effort, and flies heavily, but in migrating its powers of flight are sufficient to carry it wherever it wishes to go.

In the Potomac River, and along the Virginia coast, this bird is called the "War Loon."

THE CLIFF-DWELLERS OF THE SEA.

There is a Family of weak-winged birds whose members are all fisher-folk, and live high up on the ledges of the bold and precipitous cliffs which hem in the northern oceans. They are sociable birds, and where not destroyed by man, live in great companies varying from hundreds to thousands. They form, as a whole, a great and diverse company, divided into twenty-two well-defined species. Collectively, they are known as the Auk Family, and include 4 puffins, 6 auklets, or little auks, 5 murrelets, 3 guillemots, 2 murres, 2 auks, and 1 dovekie.

Whenever you visit Alaska, or the arctic regions, almost anywhere on salt water, you will be surprised by the abundance of the birds belonging to this Family. Wherever rocky cliffs rise out of blue water, you will find them tenanted by these interesting creatures. Doubtless, also, you will find that when such great gatherings of bird-life are to be studied and recorded, one good camera is better than ten guns.

Like the Aztecs who, like eagles, built high up in the crevices of the rock-cliffs of the gloomy Canyon de Chelly, to be inaccessible to the hostile enemies who gave no quarter, for similar reasons the feathered cliff-dwellers of the sea build in similar situations. Dearest of all spots to the nesting sea-bird is a precipitous islet of rock rising out of the sea, wholly inaccessible to the prowling wolf, fox, and wolverine, and if not actually inaccessible to man, at least so very difficult that he looks for easier conquests.

But let it not be understood that the birds of the Auk Family confine themselves to high cliffs and precipices. On the contrary, they congregate in thousands on rocky ridges, or on the tops of sandy hills—called dunes—at the sea-shore, where their nests are easily accessible to all their enemies. Just why their enormous colonies do not attract foxes and wolves by hundreds, we cannot imagine, unless it be for the reason that the general abundance of animal life dulls the edge of appetite and enterprise.

To any one interested in sea-birds, of which there is really a great variety, a trip to Alaska is replete with interest. Within a few hours after leaving Seattle, or, let us say at Port Townsend, the bird-life around the ship fairly compels attention. A flock of gulls fly so close to the rail of the hurricane-deck that some of them might be caught with a dip-net. Pigeon guillemots, and ducks of several species afloat on the cold waters of the Sound ostentatiously swim out of the steamer's track. On the ocean, it will be strange if an albatross does not sail out of space, and with far-stretching wings swoop and soar, and sail after you, hour after hour, without once flapping its wings!

In Bering Sea, no matter where you land, the chances are that thousands of murres and puffins are there to greet you with noisy cackle, and spread a cloud of wings overhead when you disturb them. Really, the rookeries of Alaska—of seals as well as birds—are alone sufficient to repay a trip to that arctic wonderland, aside from the wonderful scenery, flora, and big

game. There are dozens of birds there which we would gladly introduce to the reader, but owing to uncontrollable limitations, only the most interesting examples can be accorded space.

Of all arctic and northern sea-birds, the **California Murre**[1] (pronounced *mur*) deserves to be mentioned first, for the reason that it is and ever has been most in the public eye. This is really a subspecies of the **Common Murre**[2] of the North Atlantic, which nests on Bird Rocks in the Gulf of St. Lawrence, and sometimes comes as far south as Massachusetts. There is another North Atlantic species, called **Brunnich's Murre,**[3] also nesting on Bird Rocks, which occasionally strays down to Long Island. Both the Atlantic species are black above, and white underneath.

The California Murre is the bird which once nested on the Farallone Islands, about thirty-five miles west of San Francisco, in countless thousands, and furnished between 1880 and 1890, according to Mr. W. E. Bryant, from 180,000 to 228,000 eggs per annum to the San Francisco market. Like true Americans, the eggers always endeavored to make "a clean sweep," regardless of the future of the rookery, and under their ministrations the Murres rapidly declined in number.

Finally an appeal was made to the United States Light-House Board. The admirable record of that body in the preservation of wild life was sustained by an order which at once put a stop to all egg-gathering on the Farallones. It has already been noted in the chapter on seals and sea-lions that the only localities on the California coast where sea-lions are now safe from annihilation are the light-house reservations, the most important of which are the Farallones.

The following vivid pen-picture of the California Murre at home, on Hall Island, Bering Sea, Alaska, is from the pen of Mr. John Burroughs (Harriman Alaska Expedition, p. 109):

"The first thing that attracted our attention was the Murres—'urries' the Aleuts call them—about their rookeries on the cliffs. Their numbers darkened the air. As we approached, the faces of the rocks seemed paved with them, with a sprinkling of gulls, puffins, black cormorants and auklets.

"On landing at a break in the cliffs where a little creek came down to the sea, our first impulse was to walk along the brink and look down upon the Murres, and see them swarm out beneath our feet. On the discharge of a gun, the air would be black with them, while the cliffs apparently remained as populous as ever. They sat on little shelves, or niches, with their black backs to the sea, each bird covering one egg with its tail-feathers. In places one could have reached down and seized them by the neck, they were so tame and so near the top of the rocks. I believe one of our party did actually thus procure a specimen. It was a strange spectacle, and we lingered long looking upon it. To behold sea-fowls like flies, in uncounted millions, was a new experience.

"Everywhere in Bering Sea the Murres swarm like vermin. It seems as if there was a Murre to every square yard of surface. They were flying about over the ship, or flapping over the water away from her front at all times. I noticed that they could not get up from the water except against the wind; the wind lifted them as it does a kite. With the wind, or in a calm, they skimmed along on the surface, their heads bent forward, their wings beating the water impatiently. Unable to rise, they would glance behind them in a frightened manner, then plunge beneath the waves until they thought the danger had passed. Their tails are so short that in flying their two red feet stretched behind them to do the duty of a tail."

Mrs. Florence Merriam Bailey says that "When incubating, one bird stays on the nest during the day, and the other during the night, and when the exchange is made a great commotion ensues, the air being filled with quarrelling, screaming masses of bird-life." ("Handbook," p. 17.)

In its breeding plumage, the California Murre has a jet-black head and neck, the back is dull black, or slate color, and the under parts are white. In winter the sides of the head and throat are white. The range of the species is from California to Hall Island, Bering Sea.

The Puffins are the clowns of the bird-world. Without exception, they are the drollest-looking

[1] *U'ri-a tro'i-le californica.* [2] *U. troile.*
[3] *U. lom'vi-a.*

things in feathers. The countenance of a Puffin always reminds one of a face in a comical mask, while in manner they are so solemn, and take life so seriously, their clown-likeness is all the more pronounced.

The most remarkable feature of a Puffin is its huge, triangular beak, which is flattened out into two high, thin plates, set edgewise against the head, and gorgeously colored. After the breeding-season, certain plates at

1. COMMON PUFFIN. 2. TUFTED PUFFIN. 3. RHINOCEROS AUKLET.

the base of the beak are shed. The bird is about the size of a summer-duck. Its wings are short, and very scantily feathered, and its tail is so short as to be practically invisible. In flight its wings look very much like the wings of a penguin as it swims with them under water.

In many respects Puffins are wise birds, and if there is aught in the survival of the fittest, they should live long and prosper. They have the remarkable habit of nesting in burrows, which they dig deeply, usually about three feet, in the steep sides of sandy hills. In these retreats they can defend themselves against enemies of several kinds. In the defence of their homes they are quite courageous, and often an angry or well-frightened Puffin will seize an offending nose, or human hand, bite it severely, and hang on like a bull-dog. In places where these birds nest in burrows, sentinels are always posted outside, to give the alarm of any approaching enemy.

It is to be observed, however, that Puffins do not always nest in burrows, but frequently they find rock-ledges so rugged and broken that they can find good nesting-sites in deep and narrow crevices, wherein they are reasonably safe from molestation. A Puffin lays but one egg, which is large and white, and placed at the end of its burrow. Of course all these birds dive and swim well.

The Tufted Puffin[1] is the most widely distributed member of this genus, being found from southern California all the way up the Pacific coast to Alaska, Bering Strait, Siberia and on down to Japan. It is (or at least *was*) abundantly represented on the Farallone Islands from April to July, when they breed there.

This species is instantly distinguishable by its black plumage, its big, triangular bill colored bright red and olive green, white eye and white triangular cheek-patch. In the breeding-season, a beautiful flowing tuft of soft, yellow feathers, thick as a lead-pencil, comes forth just behind the eye, and flows backward and downward in a graceful curve.

On the Atlantic side, from Maine to Greenland, and also from Great Britain to North Cape, lives the **Common Puffin,**[2] or **"Sea Parrot."** Of this bird, the whole side of the head, and the breast and abdomen are white, the remainder of the plumage being deep black. Wherever found, it is one of the most interesting birds to be met with near the sea, and its comical appearance, queer movements and fierce temper when disturbed never fail to amuse the observer.

The Auks and **Auklets** are really birds of the cold northern waters; but on the Pacific side there are four species which touch the coast of the United States, and two of them even push their way down to Lower California. These birds are much like puffins with rational

[1] *Lun'da cir-ra'ta.* Length, 15 inches.
[2] *Fra-ter'cu-la arc'ti-ca.* Length, 13 inches.

beaks, and I believe all existing species are black above and white below. The beaks show but little tendency to the sportive flattening so characteristic of the puffins.

These birds are very strong divers, and get a great portion of their food from the bottom of the sea. The two species found all along our Pacific coast, on the Farallone Islands and Santa Catalina, are the *Rhinoceros Auklet*[1] (14 inches long), and the *Cassin Auklet*, the former so called because of an erect horny shield at the base of its beak. The *Least Auklet*[2] is only 6½ inches long—about the bulk of a small, thinly feathered screech-owl.

The Razor-Billed Auk,[3] of the North Atlantic Ocean, sometimes wanders in summer to the coast of Maine, and in winter even migrates as far south as New Jersey. (Robert Ridgway.) It is 17 inches long, and is the largest living member of the group of auks. As might be expected, it is a distinguished resident of the Bird Rocks.

The Great Auk is now a bird of history and museums only. It met its fate on Funk Island, a treeless dot in the sea, about thirty miles northwest of Newfoundland, which was the first land met with as the Auks swam southward on their annual migrations. The wings of this bird were so little developed that it was wholly unable to fly, and while on land it was any one's prey.

The thousands of Great Auks that visited Funk Island naturally attracted men who wished to turn them to account. Whalemen were landed, and left there to kill Auks and secure their feathers. The birds were either driven into pens and slaughtered there, or else the pens were used to contain their dead bodies. Apparently great numbers of the bodies were burned for fuel. About 1844, the species became entirely extinct.

When Funk Island was visited by Mr. F. A. Lucas in 1887, in quest of Auk remains, he found deposits of bones several feet in thickness, evidently where the bodies of slaughtered birds had been heaped up, and left to decay. Out of these deposits, several barrels of mixed bones and peaty earth were taken which yielded several complete skeletons of that species.

Had the Great Auk possessed wings for flight, the chances are that it would not have fallen such easy prey to its exterminators. The moral lesson of its fate is—in these days of fire-arms and limitless ammunition, no bird should be hatched without steel-plate armor, strong wings for flight, and swift legs for running away.

[1] *Cer-o-rhin'ca mo-no-cer-a'ta.*
[2] *Sim-o-rhyn'chus pu-sil'lus.*
[3] *Al'ca tor'da.*

From a photograph by WILLIAM L. FINLEY.

CALIFORNIA MURRES, THREE ARCH ROCKS, OREGON.

EMPEROR PENGUIN.

CHAPTER XXXIII

THE ORDER OF FLIGHTLESS DIVERS

IMPENNES.

No matter where man may go, on land or sea, or polar ice-pack, Nature holds birds in readiness to welcome him.

When Peary reached the point of land that is nearest the north pole, at the northeastern extremity of Greenland, on July 4, 1892, he found there the snow-bunting, sand-piper, raven, Greenland falcon, and ptarmigan. On the great arctic ice-floe, at Lat. 82° 40′, Nansen saw the fulmar (*Procellaria glacialis*), and the black guillemot, and a little later the ivory gull, little auk, and Ross's gull. When the steamer *Belgica* penetrated the awful solitudes of the antarctic archipelago, in 1898, and spent there the "First Antarctic Night"[1] ever endured by man in that region, Dr. Frederick A. Cook and his companions found, in close proximity to their ice-bound ship, flocks of large and very strange birds. They had an opportunity to study the wonderful **Emperor Penguin**[2] in its haunts, such as never before had been secured by naturalists.

This species is the largest of the wingless and flightless swimming-birds. In bulk it is about the size of our great white pelican. Its height is 3½ feet, and it stands as erect as any soldier on parade. In its erect posture its wings seem like arms, and its queer manner of talking, scolding, and prying into man's affairs, makes this bird seem more like a feathered caricature of a big, fat human being than an ordinary diving-bird. Its head is black, its abdomen is white, and its legs and feet are feathered quite down to the claws. The wings are covered with feathers that are more like fish-scales than feathers, and the feathers of the back also are very close and scale-like.

To a naturalist or bird-lover, the sight of great flocks of Emperor Penguins, and of the smaller *Pack Penguins*, on the antarctic ice-floes, must be sufficient to repay the explorer for many of the long, dark hours of the voyage that is required to reach their haunts. Says Dr. Cook:

"A number of royal and small penguins, and some seals, were led by curiosity to visit us. They called, and cried, and talked, and grunted as they walked over the ice about the ship."

I have seen and heard the **Black-Footed Penguin,**[3] of South Africa, scold and complain in a most human-like manner. On land, or on an ice-floe, this bird is so awkward and helpless that any blood-thirsty observer can walk up and kill it with a stick. Place it in water, however, and what a transformation! Immediately it will give an exhibition of diving which is astonishing.

In an instant, a waddling, slow-moving, almost helpless bird is transformed into a feathered seal. With its feet floating straight behind, *and of no use save in steering*, it points its beak and head straight forward, and swims wholly *with its wings*. Those flipper-like members reach forward simultaneously, work in perfect unison, and strike the water like living paddles—which they are. The quickness and dexterity of this bird in chasing and capturing live fishes, swallowing them under water, and instantly pursuing others, is one of the most wonderful sights in bird-life. The bird always dives with its lungs full of air, and during the middle of its period under water, it exhales. When it does so, bubbles of air issue from each corner of the mouth and float upward like two strings of pearls.

It is strange that the feet perform very little service while the Penguin is diving; but such is

[1] Dr. Cook's valuable narrative of the exploration bears this title.

[2] *Ap-te-no-dy'tes fos'ter-i.*

[3] *Sphe-nis'cus de-mer'sus.*

the fact. Of all birds that love water, I think the Penguin loves it most. It will lie on its side at the surface, and in sheer playfulness and excess of joy, beat the water with its uppermost wing, wriggle about, then turn over and splash with the other.

In the sea, a flock of Penguins is readily mistaken for a school of dolphins, because they dive so persistently, in order to swim with their wings, and thus get on in the world very much faster than if they sat up and paddled with their feet.

There are about twenty species of Penguins, of which the Emperor is the largest, and the King Penguin second. All are found in the southern hemisphere. The largest Emperor Penguin ever weighed and recorded, weighed 78 pounds! Needless to say, these birds live almost wholly upon fish, in the capture of which they are the most expert of all birds.

PRIMITIVE PENGUINS ON THE ANTARCTIC CONTINENT, UNAFRAID OF MAN.
The species shown is the Adele Penguin.
(From Sir Ernest Shackleton's "Heart of the Antarctic," by permission of William Heinemann and the J. B. Lippincott Company, publishers.)

CHAPTER XXXIV

THE ORDER OF WINGLESS LAND-BIRDS

RATITAE

Lowest of the Orders of living birds is that which contains the birds which are so nearly wingless that they are wholly unable to fly, but are provided with long and powerful legs, which enable them to run swiftly. Of these, there are a larger number of species than might be supposed, but our purpose requires here only the briefest introduction of a few important forms. The majority of the birds of this group are birds of great size, and their legs are so long and powerful they are able to kick or strike quite dangerously. These are the ostriches, rheas, cassowaries, and emeus.

The African Ostrich[1] is the largest living bird, and in every respect it is a worthy descendant of the still more gigantic but now extinct moa of New Zealand. Our full-grown male Ostrich stands, when fully erect, exactly 8 feet in height to the top of its head, and weighs about 275 pounds. The manager of the Florida Ostrich Farm at Jacksonville states that the average weight of adult African Ostriches is about 300 pounds.

Once abundant in nearly all the dry and open country of Africa, except the Sahara and Libyan deserts, this noble bird has shared the fate of the elephant, rhinoceros, buffalo and giraffe. To-day it is to be found but sparingly, and only in those regions of southern and eastern Africa wherein it has been impossible for man to exterminate it. The value in America of a full-grown African Ostrich is $250.

[1] *Stru'thi-o cam'e-lus.*

Fortunately the Ostrich farms of South Africa and southern California have proven completely successful, and bid fair to perpetuate this grandest of all feathered creatures long after the last wild flock has been destroyed. If many Ostriches still remain in the Egyptian Soudan, the stringent game-laws recently enacted to protect the wild life of that region will go far toward perpetuating them.

New York Zoological Park.

CERAM CASSOWARY.

The Rhea, or **South American Ostrich,**[2]

[2] *Rhe'a americana.*

is a bird which is so constantly overshadowed by the larger and more showy African ostrich that it is not appreciated at its true zoological value. In height it stands about 5 feet, its bulk is only about one-half as great as that of the African ostrich, and its plumage has much less value. Nevertheless, the adult bird, in full plumage, is a fine creature, of a beautiful bluish-gray or drab color, and when it opens its wings they seem surprisingly long. A fine, male Rhea "showing off" its plumage is an object which always commands admiration.

This bird inhabits Patagonia, the Argentine Republic, and the more remote plains of Uruguay and Paraguay. Frequently, half-grown birds find their way into the wild-animal markets so easily that they sell at from $40 to $50 each.

The Emeu[1] stands half way, literally, between the ostrich and cassowary, being considerably larger than the latter. Its neck and head are ostrich-like, but in the shape of its body it is more like the cassowary. Like the latter, its feathers seem like long, coarse hair, of a gray-brown color. The lower outline of an Emeu's body is almost a straight line, with the legs in the centre, and the highest point of the back curve comes directly above the insertion of the legs. Thus the Emeu appears to be, and is, a very well-balanced bird. Its home is the upland plains of Australia, so far back in the interior that it is now found only with great difficulty.

Like the cassowary, the Emeu is easily kept in captivity, and is not expensive to buy. In Woburn Park, England, owned by the Duke of Bedford, troops of these birds stalk freely over the vast green lawn; and surely no birds could be more striking, or picturesque in such situations. Strange to say, a fully grown Emeu can be bought in New York for $125.

[1] *Dro'mae-us no-vae-hol'land-ae.*

The Ceram Cassowary[2] is a big, purplish-black bird, with highly-colored patches of naked skin on its upper neck, and an elevated helmet or casque on the base of its upper mandible. Its feathers look like coarse and stiff hair from three to six inches in length, and its legs and feet are very thick and heavy for its stature. The height of a Cassowary is about 5 feet.

Cassowaries are forest-loving birds. They inhabit Australia, Ceram, and other islands of the Malay Archipelago. Because they take kindly to captivity, they are frequently seen in zoological parks and gardens, and travelling shows.

The Apteryx, or **Kiwi,**[3] of New Zealand is the lowest species in the scale of living birds. It is absolutely without wings, and it lives upon the ground in dark forests, where it can hide. Unfortunately, it has no means of defence, and is too small to escape from a dangerous enemy by running away. It is about the size of a Cochin-China hen, covered with long, stringy, hair-like feathers of a dark-brown color, and it has a long, curved beak like that of an ibis, for probing in the earth. Undoubtedly, the civilized development of New Zealand will cause the total extinction of this very shy but interesting species at no distant day.

In captivity in a zoological garden it is as shy and retiring as a beaver. In order to keep it from fretting itself to death, it is necessary to place in a corner of its cage a sheaf of straw, or a bundle of leafy branches, behind which it can retreat from observation, and lie concealed.

Outside of its New Zealand home, this bird is rarely seen in captivity, which is to be regretted, because it is one of the most interesting forms of the whole avian world.

[2] *Cas-u-a'ri-us gal-e-a'ta.*
[3] *Ap'-te-ryx aus-tral'is.*

BOOK III

REPTILES

THE GIGANTIC TYRANT DYNOSAUR OF HELL CREEK, MONTANA, ATTACKING A DUCK-BILLED THREE-HORNED DYNOSAUR FAMILY, ABOUT 4,000,000 YEARS AGO.

The Tyrant stood about 18 feet high and 47 feet long, and must have weighed 10,000 pounds. The other animal (Triceratops) was about the size of a rhinoceros.

Restored and drawn by CHARLES R. KNIGHT. Reproduced by permission of the American Museum of Natural History.

CHAPTER XXXV

INTRODUCTION TO THE CLASS OF REPTILES

The Point of View.—In studying or not studying the world of reptiles, everything depends upon the point of view. With persons in middle life, who hold up their hands and shudder at the mention of the word "reptile," there is nothing to be done. They are victims of an unreasoning prejudice that often is deliberately taught to young people, both by precept and example, until at last it becomes bone of their bone and flesh of their flesh. Human children are *not* born with the inherited fear of reptiles which is so characteristic of the apes and monkeys of the jungles; and it is not fair to terrorize their innocent souls with awful "snake stories," any more than with the "ghost stories" which most careful parents forbid.

With young people whose minds have not been artificially warped by older persons who abhor all reptilian life, much may be done.

Now, come! Let us reason together.

Despite electricity and steam, this world is yet a fairly large place. That it has existed through countless ages, and that its animal life has gone through many marvellous transformations, no one can deny, without being put to shame by the silent and immutable testimony of the rocks. This world, the animals now living upon it, and those lying within it, entombed by Nature's hand, have been *millions of years* in forming. If you doubt it, go into an Arizona canyon, half a mile in depth, and at the bottom of a mountain-wall of rock, dig out the remains of a fossil, then ask yourself this question: "How long has it taken Nature to pile half a mile of solid rock upon the grave of this creature, *and then cut down to it again?*"

In the evolution of the birds of to-day, the reptiles of the past have played an important part; and the study of the Class *Reptilia* is very much worth while, if for no other reason than to learn the nearness of the relationships between its members and the birds.

Remember, first of all, that the reptiles of to-day are actually insignificant in comparison with those which existed ages ago, the bones of which are now fast coming to light. A twenty-four-foot python or anaconda of to-day, lying beside a sixty-foot dinosaur, with a hind leg ten feet high, would be like a garter-snake beside a kangaroo.

In this day of liberal thought and broad reasoning, any person whose knowledge of the world of reptiles is limited to the false notion that all these creatures are either "slimy" or dangerous, is to be pitied. A persistence in that all-too-common estimate is a distinct loss to all those who entertain it. It means the shutting out, with the black curtain of Ignorance, of a whole world of interesting forms and useful facts, and also a lifetime of cringing fear, largely without cause.

Young Americans, I exhort you to take a broad and sensible view of the reptilian world,—as of every other great subject. Many of these creatures are worth knowing, some because they are wonderfully interesting, some because they are useful, and others because they are dangerous. *None of them, however, are "slimy"!* A snake may be cold to the touch, but its skin is as clean and free from slime as a watch-chain. What is more, there is no living creature, not even a dolphin, dripping from the sea, which possesses a skin displaying the beautiful pattern of colors and the rainbow iridescence of the reticulated python, of the East Indies. In reality there are a great number of reptiles that are undeniably beautiful.

I would it were possible to touch upon all the Orders of Reptiles, extinct as well as living, and introduce some of the gigantic and wonderful lizards that were like kangaroos, rhinoceroses, and sea-lions, and also like nothing else under the sun; but in this volume it is impossible. There is space available only for the four Orders

of living Reptiles; the seven that are extinct can be studied elsewhere by those who become specially interested in this subject.

The Grand Divisions of Living Reptiles.—There are, all told, eleven Orders of the Class *Reptilia;* but seven of them are extinct, and for the present these will be left out of consideration. The four Orders of living reptiles are made up as shown in the following synopsis:

THE ORDERS OF LIVING REPTILES.

ORDER.	PRONUNCIATION.	GROUPS INCLUDED.	EXAMPLES.
CROCODILIA	*Croc-o-dil'i-a*	Gavials, Crocodiles, Alligators	Florida Crocodile, Alligator.
CHELONIA	*Ke-lo'ni-a*	Tortoises, Terrapins and Sea-Turtles.	Box Tortoise, Painted Terrapin, Hawksbill Turtle.
LACERTILIA	*La-ser-til'i-a*	Iguanas, Slow-Worms, Skinks.	Marine Iguana, Glass "Snake," Blue-Tailed Lizard.
OPHIDIA	*O-fid'i-a*	Colubrine Snakes, Rattlesnakes, Harlequin Snakes.	Anaconda, Timber Rattlesnake, Coral Snake.

General Characters of Reptiles.—Chiefly through certain extinct species, the reptiles lead so directly into the birds that the two Classes overlap each other.

In the Berlin Museum are the well-preserved fossil remains of a bird called the Ar-chae-op'teryx, which had a long, lizard-like tail fully covered with feathers, and lizard-like teeth in its beak. In 1873, Professor Marsh discovered in the chalk-beds of western Kansas, a low-formed, penguin-like bird, called the Hes-per-or'nis, also provided with teeth.

All reptiles are cold-blooded animals, and breathe air by means of lungs. Because of the low temperature of their blood, and their slow heart-action, many of them are able to remain under water for quite lengthy periods—of minutes, not hours. Some turtles and terrapins become so thoroughly dormant at the approach of winter that the vital organs actually suspend their functions, for a period of from one to three months. It is then that these creatures bury themselves in the mud at the bottom of ponds, and so pass the winter months.

The majority of reptiles are covered with scales, or armor of solid bone, and are provided either with teeth for conflict and offence, or with armor for defence. Their means of locomotion show a wide range of variation, beginning with the clumsy-flippered harp-turtle, passing the gila monster, the swift-footed monitor, the kangaroo-like collared lizard (of Arizona), the gliding serpents, and ending with the flying dragon.

In their food habits, the range of the world's reptiles is infinitely great, embracing fruit, vegetables, herbage, and all forms of flesh, living and dead. Oddly enough, however, no modern reptile has been provided with molar teeth for the mastication of food. The saurians, lizards and serpents have teeth for seizing and holding their living prey. The turtles, however, are quite toothless, and in place of teeth their horny jaws have sharp, cutting edges for clipping up their food into pieces small enough to be swallowed without mastication.

The teeth of serpents and crocodilians generally are perpetually renewed, as fast as old teeth are worn out, and disappear. By reason of this, the lives of these reptiles are indefinitely prolonged, and it is believed that some of them continue to grow almost as long as they live.

The great majority of reptiles reproduce by laying eggs, which are hatched either by the heat of the sun, or by the fermentation of muck-heaps. Many species of serpents hatch their eggs in their own bodies, and bring forth their young alive. such species are called vivip'arous. Those which lay eggs are called o'viparous.

Some reptiles, notably the crocodiles and tortoises, continue to grow almost as long as they live. Doubtless this is also true of some large species of serpents, such as the great constrictors of India and South America.

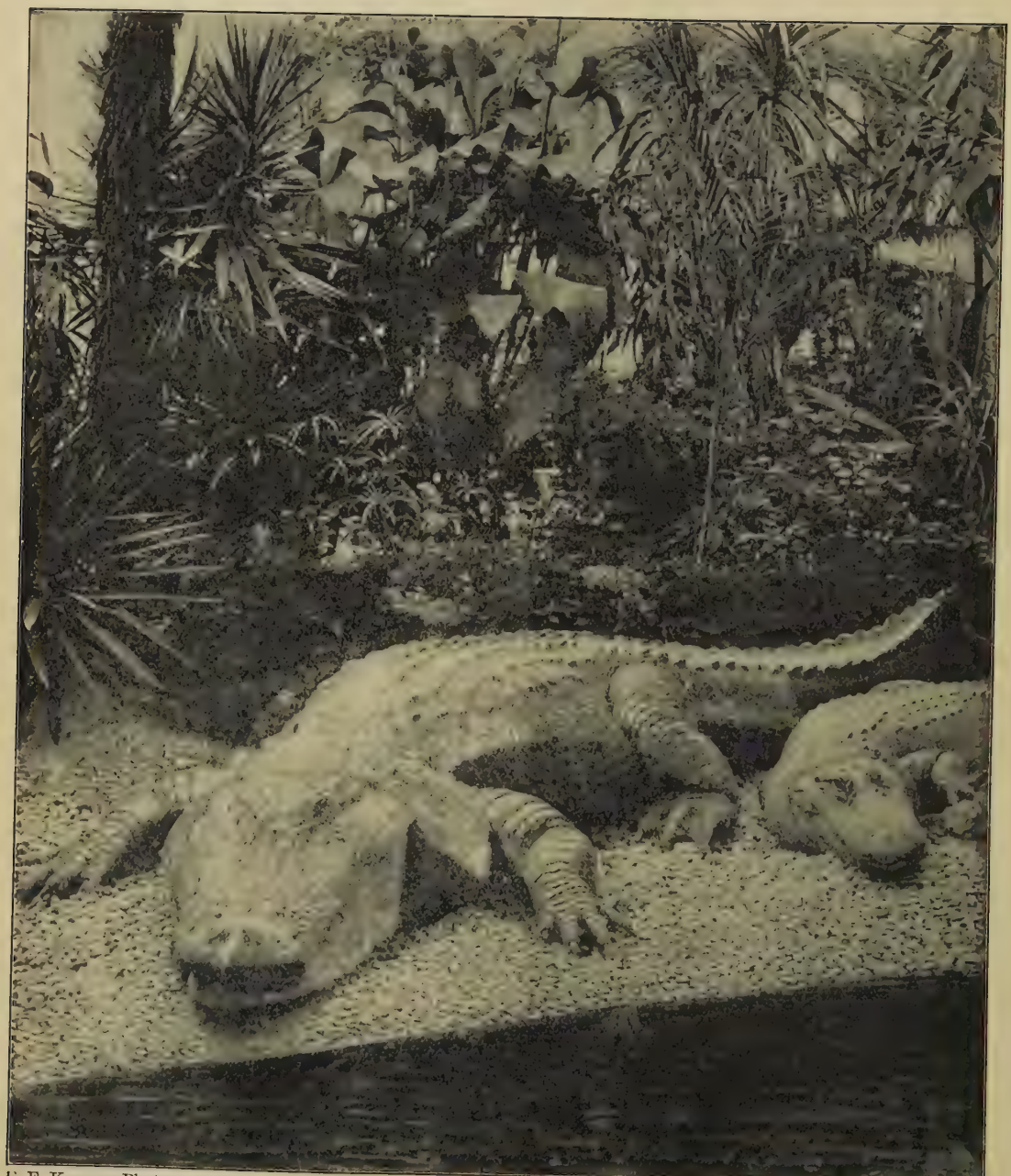
Distribution.—Reptiles reach their maximum development in the tropics, and the subtropics, between the isothermals of 32° F. North and

south of that zone, reptilian life still is abundantly represented, but chiefly by small species. The largest land-serpents are found in the low-lying, moist and hot forests of the equatorial regions; but crocodilians of the largest size are found several hundred miles from the equator, both north and south. The largest tortoises live directly on the equator.

Poisonous Species.—Among our reptiles only one lizard and a few species of serpents are venomous,—an exceedingly small proportion of the whole number. Indeed, so few in number are the dangerous species of North America, it is an easy matter for any intelligent person to learn to recognize all of them at sight. In a few hours of diligent and conscientious study, aided by a text-book that has been properly designed, any clear-headed person over fourteen years of age can learn to determine almost at a glance whether any fully grown serpent of North America is poisonous or harmless. This is possible from the fact that more than half of the venomous species possess rattles, and those which have not are few in number.

Useful Species.—Many reptiles are of decided value to mankind, by reason of the rats, mice and other destructive vermin which they destroy. Others diligently devour insects. Quite a number furnish useful food, and some yield skins and other commercial products of much value.

Lack of General Knowledge Regarding Reptiles.—While birds have been well taken care of in books, museums, zoological gardens and lectures, and mammals are now coming in for a small proportion of the attention they deserve, the reptiles have been greatly neglected. Very few zoological institutions contain collections of reptiles worthy of the name, and the books on this Class are mostly to be written. As a result of this well-nigh universal lack of opportunity for study, the great majority of persons possess very little precise and clear information regarding these creatures. The following chapters are offered merely as a foundation on which to build an acquaintance with a world of living creatures concerning which we are assured that a large number of persons sincerely desire information.



E. F. Keller, Photo.

N. Y. Zoological Park

MISSISSIPPI ALLIGATOR, "OLD MOSE."

Captured in Indian River, Florida. Length, 12 feet 5 inches.

CHAPTER XXXVI

THE ORDER OF CROCODILES AND ALLIGATORS

CROCODILIA

The warm regions of the world contain nineteen species of big, burly, bony-armored reptiles, with long tails, powerful jaws, and tempers as ugly as their own rough backs. These creatures are known collectively as Croc-o-dil'i-ans, and two Families embrace all the gavials, crocodiles, alligators and caimans of both the Old World and the New.

So pointed is the need for a clear bird's-eye view of this important group of large reptiles, it is necessary to set forth a synopsis of the entire Order. The species will be arranged in a regular series according to the width of their heads, beginning with the narrowest.

A SYNOPSIS OF THE CROCODILIANS.

The measurements given are believed to represent the maximum size attained by each species.

ORDER CROCODILIA.

FAMILY.	GENUS.	SPECIES.	COMMON NAME.	LOCALITY.
Gavial Family:	*Gav-i-al'is*	*gan-get'i-cus*	Indian Gavial, 17 feet	Northern India.
	To-mis'to-ma	*schle'gel-i*	Bornean Gavial, skull 3 feet 3 inches	Borneo and Sumatra.
Crocodile Family:	*Croc-o-di'lus*	*cat-a-phrac'tus*	Sharp-Nosed African Crocodile	W. Africa.
		in-ter-me'di-us	Orinoco Crocodile, 12 feet	Venezuela.
		johns'ton-i	Australian Crocodile	Australia.
		rhom'bi-fer	Cuban Crocodile, 7 feet	Cuba only.
		a-cu'tus	American Crocodile, 14 feet	Central and South America.
		a. flor-i-dan'us	Florida Crocodile, 14 feet 6 inches	Florida.
		nil-ot'i-cus	Nile Crocodile	Africa generally.
		po-ro'sus	Salt-Water Crocodile, 16 feet	Malayana.
		pa-lus'tris	Mugger, 12 feet	India.
	Os-te-o-lae'mus	*te-tras'pis*	Broad-Nosed African Crocodile, 6 feet	Equatorial W. Africa.
	Cai'man	*tri-go-na'tus*	Rough-Backed Caiman, 6 feet	Upper Amazon.
		pal-pe-bro'sus	Banded Caiman	South America.
		scle'rops	Spectacled Caiman	Central and South America.
		ni'ger	Black Caiman, 20 feet (Bates)	Guianas: Brazil.
		lat-i-ros'tris	Broad-Nosed Caiman	Amazon to Rio de la Plata.
	Al'li-ga-tor	*si-nen'sis*	Chinese Alligator, 6 feet	China.
		miss-is-sip-pi-en'sis	Common Alligator, 16 feet	United States.

General Characters of Crocodilians.—A crocodilian is a lizard-like reptile, of very large size, with short, thick legs, a long tail, and the most highly developed vascular system to be found among reptiles. Its back and neck are protected by powerful armor consisting of rough, lozenge-shaped plates of solid bone set in a very thick and tough skin, and arranged in rows, both lengthwise and crosswise.

Both the tail and the abdomen and throat are covered by a regular arrangement of tough scales. The whole animal is covered by a thin, transparent epidermis which is impervious to water. The tail is long, flattened vertically, and fringed along the top with a row of lofty, saw-toothed scales of great use in swimming.

The head is a mass of well-nigh solid bone, overlaid by the same thin layer of scaly epidermis which covers the body, of the thinness of writing-paper. The nostrils are placed far forward, near the end of the snout. The jaws possess great strength, and are armed with rows of sharp-pointed, conical teeth which are shed when worn out, and renewed.

The tongue is not free, but is firmly attached to the bottom of the mouth. Its color *never* is red, but usually is yellowish-white, and sometimes pinkish. The iris of the eye is dark green, and the pupil is very narrow, and vertical. The eyelids are movable, and the ear opening closes tightly by a flap of skin controlled by voluntary muscles.

Most saurians are voiceless or nearly so; but the alligator emits a very deep bellow, or roar, which in animals over ten feet in length is much lower on the scale than any fog-horn.

"The difference between a crocodile and an alligator" (a question that has been asked a countless number of times) consists chiefly in the shape of the head, and the manner in which the teeth are placed in the lower jaw. The typical crocodile has a narrow, triangular head, terminating in a rounded point. The head of an alligator is broad, with almost parallel sides, and at the end it is broadly rounded off. The canine tooth in the lower jaw of a crocodile fits on the outside of the upper jaw, in a notch close behind the nostrils; whereas in the alligator, the same tooth fits into a pit in the upper jaw. just inside the line of the upper teeth.

The heads of living crocodilians show wide but progressive variations in breadth, as the annexed series of figures reveal. The gavial, of the Ganges and Jumna, in northern India, has a snout like the handle of a saucepan, set with four rows of long and very sharp teeth. After the gavial of Borneo, its nearest relative is the Orinoco crocodile. At intervals come in the

1. GAVIAL. 2. ORINOCO CROCODILE. 3. FLORIDA CROCODILE. 4. INDIAN CROCODILE. 5. MISSISSIPPI ALLIGATOR.

Florida crocodile, the mugger of India, followed by the broad-headed West African crocodile, and ending with the alligator, widest of all.

THE CROCODILE FAMILY.

Crocodilidae.

Erroneous Impressions Corrected.—Regarding these reptiles, a number of the erroneous impressions which are now prevailing should be corrected. Some of them are as follows:

The true crocodiles are *not* confined to the Old World, four species being found in America.

Alligators are not wholly confined to America; for a small species exists in China.

The "movement" of a crocodile's jaws differs in no manner whatever from that of an alligator.

Only a very few species of crocodilians are dangerous to man.

So far as the author is aware, there is no authentic record of the loss of a human life by our common alligator.

All crocodilians swim with their tails, not their feet.

The skin of a large crocodilian is by no means impervious to rifle bullets. A bullet sometimes strikes a bony plate and glances off; but a proper bullet, properly placed, will penetrate the skin or armor of the largest alligator or crocodile, at any point.

The author believes that no crocodile or alligator of to-day exceeds 20 feet in length, by actual measurement; and one of that length is one out of ten thousand.

Food.—Crocodilians are not epicures, and some species devour all kinds of vertebrate animals that they can capture, from man to mud-hens. But the supply of obtainable mammals and birds is very limited, and fish constitutes by far the greater portion of their daily food. If all the scaly monsters of this Order were limited in food to the mammals and aquatic birds which can be seized when drinking at the water's edge, or swimming in mid-stream, they would indeed go hungry.

It is a comparatively easy matter for a large crocodilian to seize a quadruped of medium size, draw it into deep water while struggling, and drown it.

In the Reptile House of the Zoological Park, during a fight between two large alligators in the pool, it was discovered how an alligator dismembers a bulky victim in order to devour it. An alligator seized a fighting enemy by one leg, and using his tail as a propeller, whirled himself round and round like a revolving shaft, until in about five seconds the leg was twisted off, close up to the body! That deadly rotary movement would have torn a leg from a small elephant.

On another occasion, a twelve-foot alligator named "Moses" became angry at an eight-foot companion, seized it by the body, lifted it clear of the water, and shook it until the tough skin of the back was torn in two at the joint immediately in front of the hind legs.

In the course of work among the crocodiles of Ceylon, I found that some crocodiles will eat the flesh of their own kind, and do so with genuine relish. Crocodiles which I skinned and left beside a pool were promptly eaten by their relatives, who in their turn were also killed, dissected and eaten.

Man-Eating Crocodiles.—Out of the nineteen species of crocodiles and alligators (eight of which I have observed in their haunts), so far as I can learn only three are dangerous to man. The most dangerous man-eater is the salt-water crocodile of the Malay Peninsula, Borneo and surrounding regions. This reptile attains a size of sixteen feet, and in the Territory of Sarawak, Borneo, it devours so many people the government has for years paid a cash reward for its destruction. Its method is to take advantage of the murky waters of the rivers, swim up to a village bathing-place, seize any man or woman found bathing in the shallow water, or filling a water-jar, and back off into deep water.

The West African crocodiles,[1] of Angola and other portions of West Africa, are the boldest of all crocodilians, sometimes attacking people who are in canoes, and dragging a victim from a boat. (William Harvey Brown.)

The gavial and mugger of India are harmless to man, and so are the American crocodiles, and the alligator. I have gone swimming in the home waters of both the gavial and alligator,—the two extremes in jaw development,—and therefore feel sure that both are harmless.

Nesting-Habits.—All the crocodilians repro-

[1] This is the Nile crocodile, which is widely distributed throughout Africa.

duce by laying from thirty to sixty oblong, perfectly white eggs, in layers, in a low mound of muck, or vegetable mould, or sand. The female lies in wait to defend her eggs while they hatch through the heat of the sun, or by regular fermentation. From the nest of the salt-water crocodile I have taken fifty-five eggs, from the gavial, forty-one and forty-four, from the Florida crocodile, twenty-six, and from the alligator, thirty-eight. The nest of the alligator is about two feet high and four feet in diameter.

At birth, young alligators are about eight inches long. As soon as they are out of the shell, they are wide-eyed and alert, and ready to take to the water. At this period, the muzzle is short, abnormally broad, and the arch of the forehead very high.

Growth and Size.—In the Reptile House of the New York Zoological Park, we have recorded the following facts regarding the rate of growth of our alligators:

	Inches.	Weight.
Length when hatched,	8	1¾ oz.
" " one year old,	18	9¼ "
" " 22 months old,	23	3 lbs.
" " 29 " "	45	14 "

An alligator when received measured 6 ft. 11 in.
During the first year it grew 1 ft. 3 in. and measured..... 8 " 2 "
During the second year it grew 1 ft. 1½ in., and measured..... 9 " 3 "
During the third year it grew 1 ft. 7 in. and measured.....10 " 11 "
Length of "Old Mose," July, 1899, 12 feet.
Length of "Old Mose," July, 1903, 12 feet 5 in.

Judging by the rate of growth of specimens of all sizes under constant observation in the Zoological Park, where they probably are growing as rapidly as they could in a wild state, I have reached the conclusion that, under ordinary circumstances, a wild crocodile or alligator is about ten years in attaining a length of twelve feet. The average rate of growth up to twelve feet appears to be about 1.4 inches per month. After twelve feet has been attained the rate is much slower, being (in the case of our largest specimen) about two inches per year.

The secret in securing rapid growth in captive crocodilians lies in giving them a pool four feet deep, of water warmed to a temperature of between 80 and 90 degrees F. If kept in cold water, and but little of it, they are uncomfortable, they feed sparingly, and grow either very slowly, or not at all.

AMERICAN SPECIES OF CROCODILIANS.

The Florida Crocodile[1] is the type which represents the midway average between the two extremes of the crocodilian series,—narrow-beaked gavial and broad-snouted alligator. It is a subspecies of the so-called "American" crocodile (*Crocodilus acutus*), of Central and South America, and is not found elsewhere than in southern Florida. It is the only crocodile which inhabits a country that is visited by killing frosts.

The presence of a true crocodile in Florida was not discovered until 1875, when a pair of specimens of large size were collected in Arch Creek, at the head of Biscayne Bay, by Mr. C. E. Jackson and the writer. The male measured 14 feet 2 inches (with 4 inches of his tail missing), and the female 10 feet 8 inches. Since that date, at least seventy specimens have been taken between Lake Worth and Cape Sable. Lake Worth is the northern limit of the species, but it is most abundant in the watery labyrinth of low land and shallow water where the mainland of Florida reluctantly sinks into the Gulf.

The alleged "big 'gator" of Arch Creek was very wary, and permitted no boat to approach within rifle-shot. Even a boat completely masked by green branches, and innocently floating with the current, was enough to send the old fellow quickly sliding from his basking-place on the bank into deep water. At last, however, we shot him from an ambush in the mangroves opposite his mid-day lair, and secured him. His mounted skin is now to be seen in the United States National Museum.

The adult male Florida Crocodile is very rough, externally, and usually its natural colors have been so far obliterated by age and exposure that on its upper surfaces its color is a dull, weather-beaten gray. The females, and males under eleven feet, are of a clean, grayish-olive color,—or dull yellowish-green,—very different indeed

[1] *Cro-co-di'lus a-cu'tus flor-i-dan'us.*

from the funereal black of the alligator. This difference in color between our crocodiles and alligators is so marked it is quite noticeable at a distance of 200 feet, or more.

The Florida Crocodile digs burrows in the sandy banks of the Miami River, and other deep streams where the ground is suitable. These lairs are used as hiding-places, resting-places, and doubtless also as warm retreats in which to escape the cold waves from the north, which about once every five years produce killing frosts as far south as Miami.

that he has become very expert in making captures. For $50 he will at any time take out a party of "tourists," go to a Crocodile's burrow, and with a noose, capture the reptile alive and unhurt. In each case he guarantees that the Crocodile shall exceed nine feet in length. He locates the burrows in advance, by probing for them in the sand, with a sharp-pointed iron rod. With this iron rod, the reptile is driven out of its lair, and rarely does Joe fail to make a capture "as advertised."

Many other persons in Florida have captured

E. R. Sanborn, Photo, New York Zoological Park.

FLORIDA CROCODILE.

The entrances to these burrows are either under water, or half submerged, and they extend into the bank from ten to thirty feet. At their extremity, they are widened out sufficiently to permit the owner to turn around. Usually, the banks are so low that the top of a burrow is only about two feet below the surface.

This burrowing habit of the Florida Crocodile has led to a very droll and uncommon industry. A young man named "Alligator Joe," of Palm Beach and Miami, knows his game so thoroughly

crocodiles and alligators in their burrows, by means of a long pole of tough wood with a strong and very sharp iron hook lashed on one end. When this pole is thrust into a burrow the reptile bites it viciously, and holds on stubbornly. But even if inclined to let go, the sharp hook engages the tongue or other portions of the mouth, and thus the creature is dragged by sheer force into the hands of his captors, and bound with ropes.

The Cuban Crocodile[1] is a small species,

[1] *Croc-o-di'lus rhom'bi-fer.*

with a narrower head than the preceding, and with two more rows (six in all) of bony plates along its back. It is the smallest species of crocodile now living, and so far as I have observed, also the most savage in disposition. It is olive green in color, slender in form, quick as lightning in some of its movements, and much given to roaming overland, or following up tiny watercourses, in search of new hunting-grounds. I once shot a full-grown specimen in a very small brook, near the geographical centre of the Isle of Pines, Cuba, and saw others in a salt-water lagoon on the north shore of that island. So far as known, it is not found elsewhere than in Cuba.

The American Crocodile inhabits the northern coast of South America, and the Gulf coast of Central America, up to Mexico. In the lagoons along the coast of Colombia, a short distance eastward from the mouth of the Magdalena River, there are small bays so thickly infested with reptiles of this species, and of such great size, that very courageous men of my acquaintance have not dared to enter in a small boat.

The Orinoco Crocodile[1] is marked by a very narrow snout, by which character it is but two places removed from the slender-beaked gavials of India and Borneo. In 1876 I found this species abundant in the Orinoco River, seven miles below Ciudad Bolivar, and killed a twelve-foot male specimen which was undoubtedly very old.

Of the **Cai'mans,** there are five species, all of which strongly resemble our alligator, and inhabit Central and South America, and portions of the West Indies. The *Eyebrowed Caiman* has the widest distribution, and is found from southern Mexico to the Argentine Republic. The *Black Caiman,* of the Guianas and Brazil, is the largest, and is said to attain a length of twenty feet. (Bates.) The *Rough-Backed Caiman,* of the Upper Amazon, is said to be quite small—only six feet in length. (H. Gadow.)

The Alligator[2] is so well known it needs no particular description. In individuals over eight years of age, and ten feet in length, the eight yellow bands around the tail practically though not wholly disappear, and from that time on the animal is of a uniform dull black color above, and dirty yellow or white below. I never saw a living specimen larger than "Old Mose" (12 ft. 5 in.), and only one mounted skin which exceeded fourteen feet. That one measured 16 feet 3 inches, and is believed to be in a museum in Louisiana.

The Alligator finds its northern limit in southeastern North Carolina. From thence its range extends southward along the Atlantic and Gulf coasts to Cape Sable, the southern point of Florida, and westward through the Gulf states to the Rio Grande in southern Texas. Twenty-five years ago, this reptile existed in certain portions of its range, especially Florida, in great abundance; but about that time Alligator leather became fashionable, and the demand thus created has reduced the visible supply of Alligators by about 98 per cent. To-day you may travel from Jacksonville to Miami without once seeing the black line upon the water which betokens the existence of an Alligator; and an experienced Florida hunter has declared his belief that there is not now living in that state a specimen as large as "Old Mose" of the Zoological Park.

The habits of this reptile are quite similar to those of crocodilians generally. In Florida it burrows in sand-banks precisely like the Florida crocodile, and builds a mound of earth, moss, and grass about two feet high, in which it lays from twenty to forty eggs.

The Alligator is the only Crocodilian I ever heard utter a vocal sound of any kind. The bellow of this animal, however, is well known. Every day, regularly when the whistles blow, the five Alligators in our Reptile House lift their heads out of the water at an angle of 45°, and bellow, or roar, in concert, four or five times, making a truly unearthly noise. "Old Mose" is an excellent living understudy of "Pfafner," the bellowing dragon of Wagner's "Siegfried."

The Chinese Alligator was discovered in 1870 by Swinhoe, and described by Fauvel in 1879. It is quite strange that the nearest living relative of our Alligator should live in the Yang-tse-Kiang River, in China; but it appears to be true. It is a small species, only about six feet in length, of a greenish-black color, dotted with yellow. A specimen in the author's possession so closely resembles our American species that specific differences are difficult to point out.

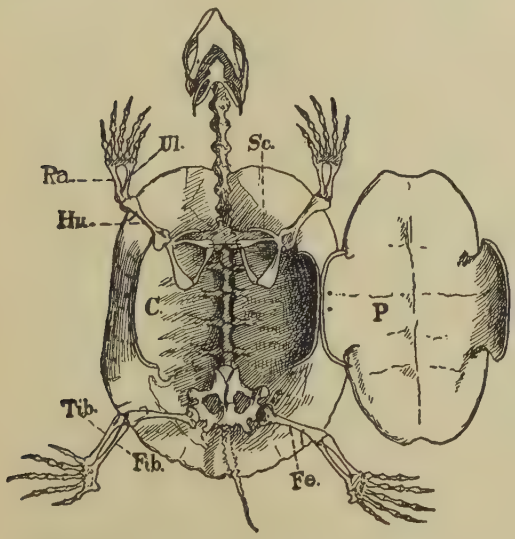
[1] *Croc-o-di'lus in-ter-me'di-us.*
[2] *Al-li-ga'tor miss-is-sip-pi-en'sis.*

CHAPTER XXXVII

THE ORDER OF TORTOISES, TERRAPINS, AND TURTLES

CHELONIA

Surely there are few intelligent persons to whom a live turtle does not appeal. From the impregnable box tortoise to the grim alligator terrapin, the giant tortoise of Galapagos, and the marine monsters of the Gulf Stream, the diversity in form and habit is very great. Fortunately, however, a fixed knowledge of twelve species will give a very good foundation on which to build up this Order.



SKELETON OF A FALSE GEOGRAPHIC TURTLE

(*Graptemys pseudogeographicus.*)

P, plastron,
C, carapace,
Ra, radius,
Ul, ulna,
Hu, humerus,
Tib, tibia,
Fib, fibula,
Fe, femur,
Sc, scapula.

General Characters.—A member of the Order of Turtles is a reptile which has its skeleton on the outside of its body, and its vital organs completely encased in a box of bone, called a *shell.* The top half of the shell is called the *car'apace,* and it is formed by the widening of the ribs until they grow together and firmly unite wherever their edges meet. The lower portion of the shell is called the *plas'tron.* The carapace of a male tortoise is hollowed out underneath, but that of the female is flat. The shell has an opening at the front end to receive the head, neck and fore-legs, and the rear is open to afford space for the hind legs and tail. The shell of a turtle is a city of refuge, into which its owner withdraws its head and feet whenever threatened by enemies. In some species the shell is a remarkably perfect means of defence.

These reptiles have no teeth, but the edges of their strong, horny jaws are sufficiently sharp and chisel-like to enable them to cut up vegetable food. The head and neck move freely, in and out. The skin is very tough and leathery. Like other reptiles, the members of this Order reproduce by laying eggs and burying them, to be hatched by the sun. Some of the large tortoises live to the greatest age attained by any living creatures now on the earth.

In the original classification of the land-going tortoises, and the water-loving turtles and terrapins, it was an unfortunate mistake that the name "tortoise" was not limited to the dry-land species, "terrapin" to the hard-shelled species inhabiting fresh water, and "turtle" to the species with flippers which inhabit the sea. To-day the names "tortoise" and "turtle" are applied so indiscriminately through all three of the groups mentioned, they are useless as distinctive titles and the mixture is mischievously confusing. In the interest of common sense I therefore propose the following revised system of these common names:

1. All Chelonians of the land only shall be called ..... *Tortoises.*
2. All Chelonians of fresh-water shall be called ..... *Terrapins.*
3. All Chelonians of the sea to be called ..... *Turtles.*

To this at least one person will henceforth try to adhere.

The following is a common-sense grouping of the members of the Order Chelonia, as found in North America and the seas adjacent:

3 inches, with a height of shell of 20 inches, was estimated to be 400 years old! Its age was estimated by comparison with other Giant Tor-

SYNOPSIS OF THE ORDER OF TORTOISES AND TURTLES.

ORDER.	SUBORDERS.	FAMILIES.		EXAMPLES.
AMERICAN CHELONIA.	LAND TORTOISES:	COMMON TORTOISES, BOX TORTOISES,[1]	*TES-TU-DIN'I-DAE,*	Giant Tortoise. Gopher Tortoise. Common Box Tortoise.
	FRESH-WATER TERRAPINS:		*KIN-O-STER'NI-DAE,*	Musk-Terrapin.
		SMOOTH-SHELLED TERRAPINS,	*E-MYD'I-DAE,*	Painted Terrapin. Wood-Terrapin. Diamond-Back.
		SNAPPING TERRAPINS,	*CHE-LY'DRI-DAE,*	Alligator-Terrapin. Snapping Terrapin.
		SOFT-SHELLED TERRAPINS,	*TRI-O-NYCH'I-DAE,*	Soft-Shelled Terrapin.
	SEA-TURTLES:	HARD-SHELLED,	*CHE-LON'I-DAE,*	Hawksbill. Green Turtle.
		LEATHERY-SHELLED,	*DER-MO-CHE-LYD'I-DAE,*	Harp-Turtle.

THE TORTOISE FAMILY.

Testudinidae.

The group of tortoises contains many species that are either beautiful, or curious, or remarkable for their size and age. Quite a number of species are handsomely colored, but the majority are perfectly plain.

Two distinct types have been developed. The ordinary, thick-shelled, uncolored tortoises, some of them of great size, constitute the majority of the species. The smaller section is made up of small tortoises, some of which have a practical hinge in the centre of the lower shell. These are strictly land-going animals, and some of them even burrow in the earth, in sandy situations where digging is easy.

The Giant Tortoise[2] is a good species to lead this entire Order. If there be aught in the theory of "the survival of the fittest," then this creature is clearly entitled to the leading position. A specimen at the New York Zoological Park, which weighed 310 pounds, and whose shell measured on its curves 4 feet 7½ inches by 4 feet

toises which, according to authentic history, have been in captivity over 100 years.

This wonderful creature lived all save the last two years of its life on the Galapagos Islands, a group of burnt-out volcanoes, and mountains of rock covered with brush, cacti and lava, directly on the equator, 500 miles west of Ecuador. Six species of Giant Tortoises inhabit that archipelago, living chiefly upon cacti and coarse grass, but all of them are now being exterminated at a very rapid rate either for the paltry amount of oil they contain, or a few pounds of meat from each. An ignorant cattle-herder thinks nothing of killing a Tortoise 300 years old for three pounds of meat, nothing more! In the interests of science, and her own reputation, Ecuador should prohibit henceforth the wanton and wasteful killing of those remarkable creatures.

With the exception of the crocodilians, the Giant Tortoises inhabiting the Galapagos Islands, and two islands in the Indian Ocean, are the only survivors of the famous reptilian age, when a warm atmosphere heavily charged with moisture called forth luxuriant vegetation, which nour-

[1] By some authorities on the classification of reptiles, the Box Tortoises are placed in the Family *Kinosternidae*, one of the divisions of the Fresh-Water Terrapins. If this arrangement should be followed, it would take the Box Tortoises out of the group of Land Tortoises, where they really belong. With this explanation the author elects to preserve the very useful arrangement into land, fresh-water and marine groups, as set forth above, and leave the Box Tortoises in the Family *Testudinidæ*.

[2] *Tes-tu'do vi-ci'na.*

ished a marvellous series of gigantic reptilian forms. Beside some of these extinct creatures our largest reptiles are mere pygmies, and to-day they are equalled in bulk only by the rhinoceros, hippopotamus, elephant, and whale. The great Brontosaurus, whose fossil remains were found in the bad-lands of Wyoming, was sixty feet long, and some of the great Dinosaurs, or kangaroo-like lizards, stood over thirty feet in height!

Beside the Giant Tortoises, our **Gopher Tortoise,**[1] the largest allied species of tortoise we possess, seems insignificantly small. The largest specimens weigh only fifteen pounds. This species is found from South Carolina to Florida, and westward to Texas. It has a very thick and strong shell, and burrows in the earth of the sandy pine-forests in which it lives. Its shell is smooth, and unmarked by bright colors, and its flesh is palatable food.

The Box Tortoise[2] is, to my mind, one of the small wonders of Nature, the special purpose of which is to point out how far "specialization" can go in fitting an animal to survive. After all, the most interesting things about animals are the lessons they teach bearing upon the development of the world and its inhabitants.

[1] *Tes-tu'do pol-y-phe'mus.*
[2] *Cis-tu'do carolina.*

Excepting these and similar forms, the small Chelonians find refuge from danger in the watery depths of the ponds and streams they inhabit. The Box Tortoise, however, formed for life on land, is so small it has required a special invention for its protection.

Its shell is high, and contains sufficient room to permit the head, legs and tail to be fully withdrawn within it. Across the centre of the lower shell, or plastron, a practical double hinge has been provided. Thus, in time of danger, the animal completely withdraws its head, legs and tail, at both ends it draws the lower shell tightly against the upper, and all the soft parts are entirely out of reach, behind strong walls of bone. The box of bone is as tightly closed at all points as a strongly made cigar-box with the cover nailed down.

BOX TORTOISES.

The Box Tortoise is an illustration of the fact that several species of tortoises are quite handsomely colored, in geometric patterns of black or red lines, on lighter ground-colors. A representative specimen of this species is covered with an open fret-work of black bands laid in a mechanical pattern on a lemon-yellow ground-color. North of the range of the gopher tortoise, the Box Tortoise is our only genuine tortoise,—living only upon land, and never inhabiting water. It is common all around New York City, and is

found even in the large northern parks, where it inhabits the well-shaded forests in situations as remote as possible from the paths of men. The moist valleys of the Zoological Park have yielded many fine specimens to the Reptile House collections, where they live contentedly. The Carolina Box Tortoise is found throughout the eastern United States from the Atlantic coast to the Mississippi River, and in the South is called the Pine-Barren "Terrapin."

THE MUD-TERRAPIN FAMILY.

Kinosternidae.

The Family *Kinosternidae* was invented for the special accommodation of the box tortoises, with plastrons hinged across the middle; but in an unguarded moment the Mud-"Turtle," Musk-

MUSK-"TURTLE."

"Turtle" and similar terrapins with fixed plastrons were included. To-day, oddly enough, there is a decided inclination to leave the Box Tortoise in the Tortoise Family—where they belong, and leave the Musk-Turtle and his nearest relatives in possession of the abandoned order. But to the general student, all this is of but momentary interest.

The Musk-"Turtle,"[1] or **Stink-Pot,** has been loaded down with names in two languages which proclaim a smelly character. It is a commonplace little terrapin about six inches long, inhabiting quiet ponds or sluggish streams, basking in the sun when it is safe to linger above high-water mark. Occasionally it so far forgets itself as to swallow a worm-baited hook, and bring on trouble of two or three kinds. Its regular food is aquatic insects, minnows, fish-eggs, worms, and in fact any fleshy creature slow enough to be caught and small enough to be eaten.

The Musk-"Turtle," or Terrapin, is possessed of a very noticeable musky odor, which serves better as a distinguishing character in the living specimen than its very dull color and general commonplacedness of external appearance. Sometimes it shows a few spots; and the neck bears two stripes, one starting above the eye, the other below it. The plastron shows a slight tendency toward a practicable hinge, but it is only a suggestion, for the shell is practically rigid, and incapable of closing. This species, like all the terrapins of the North, burrows into the mud of pond-bottoms at the approach of winter weather, and lies dormant, with the functions of Nature suspended, until spring. It is found abundantly in the eastern United States, and ranges westward into Illinois.

SMOOTH-SHELLED TERRAPINS.

Emydidae.

Numerous indeed is the company composing the group of pond and river Chelonians, which live half in and half out of the water. They vary in size from the little musk-terrapin, no larger than the palm of your hand, to the big alligator-terrapin, of Louisiana, with a shell 23 inches long, and a gross weight of 115 pounds, or more. There are many species that are valuable as food, and one which is now accepted as the symbol of epicurean luxury. As usual, only the types of greatest importance and widest distribution will be mentioned here.

If it were necessary to choose a single species to represent the many species of North American Terrapins, that choice might well fall upon the **Red-Bellied Terrapin,**[2] or **"Slider."** This is a species above the average size. The largest specimen in our collection weighs 10 pounds, and its shell is 13 inches long by 9 inches wide, axial measurement. It is handsomely and plainly marked by its back of umber brown, and reddish-white under-surface. It is alert and active, its distribution is wide, and its flesh is excellent. When you go to a restaurant and order diamond-backed terrapin, at a dollar a plate, you may know to a certainty what you are eating and paying for.

[1] *Ar-o-mo-chel'ys o-dor-a'tus.*

[2] *Pseu'de-mys ru-bri-ven'tris.*

Nine times out of ten it is Slider, no more, no less; and a very good dish it makes, too.

Of the genus to which this animal belongs, there are in North America at least six other species, all of them habitants of the southern half of our country. The Slider ranges northward only as far as Delaware, and the Susquehanna River in Pennsylvania, but is frequently seen in the New York markets. Of the terrapins that are in the habit of sunning themselves on logs within diving distance of rivers, creeks or ponds, this species is, I think, the largest we are accustomed to see. Even at quite a distance it can be recognized by the height and narrowness of its shell, as compared with species of other genera.

The Painted Terrapin,[1] hitherto called at random the **Painted "Turtle"** and **Pond-"Tortoise,"** is perhaps the most widely distributed species, and the one available to the greatest number of school-rooms, in the United States. It inhabits the whole region east of the Mississippi River except the extreme southeastern states, or about one-half of the entire country. Its shell is from 6 to 8 inches in length, and its contour is rather flat. The plates of the carapace are greenish-black, edged with yellow, and those around the margin are marked with bright red. The under shell (plastron) is yellow with brown markings; and the legs and tail are dark brown, marked with bright red lines. The upper jaw is notched in front.

This small boy's favorite is a very common species, and nine times out of ten when a nice, well-behaved little Terrapin is seen sunning itself on the hurricane-deck of a derelict log, ready to drop into the water with a gentle *plash* when Small Boy approaches dangerously near, that is It. It is called the Pond-Terrapin because it dislikes the nerve-wrecking hilarity of a river which rushes past at two or three miles per hour, but prefers a nice, quiet little 4 × 5 pond, where it can vegetate quite unmolested. In captivity its food consists of chopped fish and meat and angle-worms.

The Ellachick,[2] of the Pacific slope, from the Sierra Nevadas to the coast, and from southern California to Vancouver, is the most important species in that region. It is good for food, and is frequently seen in the markets of the large cities on or near the coast. It is about the size of the painted terrapin.[3]

The Diamond-Backed Terrapin[3] of the salt marshes is, most unfortunately, famous for the flavor of its flesh, and its association with champagne. From the unlucky day when the epicures of Maryland pronounced terrapin stew a particularly delicious dish, the doom of this species has been sealed. Its price has risen from the original 25 cents each for large ones to $70 per dozen for small ones, and the supply is rapidly dwindling to nothing. It is now a difficult matter for a zoologist to procure for exhibition a specimen that is more than half grown.

In appearance the Diamond-Back is neither beautiful nor striking, and in flavor I think it has been greatly overpraised. At the same time

PAINTED "TURTLE."

A good example of the Smooth-Shelled Terrapins.

as reptiles go (for human food), its flesh is really very good; but, with all the good things that go into a terrapin stew, and champagne for sauce at three-fifty a bottle, almost any animal would taste good.

The Diamond-Back Terrapin is a habitant of salt water, and at one time was found in the shallow bays and salt marshes along our Atlantic and Gulf coast from Massachusetts to Texas. Chesapeake Bay has always been a sort of centre of abundance of this species, and when it flourished the markets were supplied chiefly from the region lying between New York and Pamlico Sound.

This Terrapin is small, rather flat, rounded

[1] *Chrys-em'ys pic'ta.*
[2] *Chel'o-pus mar-mo-ra'tus.*
[3] *Mal-a-co-clem'mys pa-lus'tris.*

in outline, and its scales are marked by independent black patterns composed of many geometric figures, placed one within another. A

WOOD-"TURTLE" (*Chelopus insculptus*).

Back rugose. An exception to the rule of Smooth-Shelled Terrapins.

specimen with a plastron seven inches long, and weighing a pound is a large one. Formerly the great majority measured between 4 and 5 inches; but now, it is difficult to find one large enough to make a "count" by the old standard. A "count" Terrapin must measure 5 inches (in some markets it is 6 inches) in the length of the lower shell.

Beyond reasonable doubt, the continual destruction of the largest specimens will erelong render the species unproductive, and it will cease to exist. The persistent destruction of fathers and mothers will soon wipe out the strongest species in existence. It is reported, however, that in the South there are several terrapin "farms" on which this species is being bred and reared for the markets, in large numbers.

THE SNAPPING TERRAPINS.

Chelydridae.

The Alligator-Terrapin,[1] of Louisiana, and other states bordering on the Gulf between Florida and Texas, is, when adult, a huge, rough-backed, big-headed creature, weighing from 100 to 125 pounds, and even attaining on rare occasions to 150 pounds. This is the largest terrapin in North America, and also the ugliest. The broad and rather flat table of its upper surface rises in a series of brown hillocks, earthy-looking, and often actually covered with moss.

The head is of huge proportions, and the strength of the jaws is very great. The tail is very long and fleshy,—which is rather unusual in Chelonians. Notwithstanding the rough exterior of this creature, its flesh is eaten by many persons who share its habitat.

This remarkable reptile is found only in the semi-tropical fresh-water bayous and streams of the South. A specimen now living in the Reptile House at New York measures as follows:

Length of head and neck	12 in.
" " shell	23 "
" " tail	19 "
Total length	54 "
Width of shell	18 "
Weight	113½ lbs.

It is a shy animal, and if not permitted to live under the crocodile's raft which floats in the pool, it will not eat its usual daily ration of raw meat or fish. It never attempts to leave the water, and can remain submerged, without breathing, for periods which are so long we can only describe

ALLIGATOR-TERRAPIN.

From Louisiana. Weight, 113½ lbs.

them as "indefinite." In its home, this burly reptile feeds upon fish, frogs, and other water-animals.

[1] *Mac-ro-chel'ys tem-minck'i.*

The Snapping Terrapin, or **Snapping "Turtle,"** [1] which is found in the northern states as well as in the South, is a very cross-tempered and savage understudy of the preceding species, and it is ugly in more senses than one. It has a humpy, moss-covered back, a mean eye, a dangerously sharp and hooked beak like a horned owl, and a tail that reminds one of the terminal half of a bloated water-moccasin.

This reptile seldom leaves the waters of the ponds in which it lives. It believes most thoroughly in the survival of the fittest, and to it the Fittest is "Number One." It is a chronic fighter, and inasmuch as its jaws are very strong,—and, like some men, never know when to let go,—it is a reptile to be either mastered or avoided. It is wholly carnivorous in its habits, and is very destructive to fish and young waterfowl.

Strange to say, the Snapping Turtle is regularly consumed as food, and is often sold in the Centre Market at Washington.

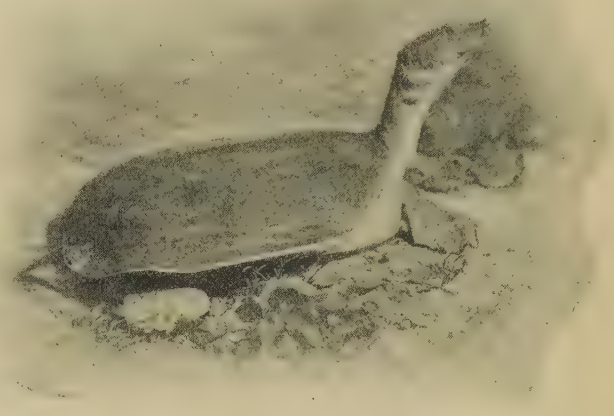
THE SOFT-SHELLED "TURTLES."

Trionychidae.

This Family is of ancient lineage, and wide distribution, its members being found in the rivers of Asia, Africa and North America. Wherever found they may be recognized by very flat and nearly circular shells that are imperfectly ossified, both above and below, and which terminate at the edges in thin plates of leathery skin. The nose is prolonged into a decided proboscis, and the neck is long and flexible. In some species (found in Australia) the neck is so very long it cannot be withdrawn into the shell, but in times of danger it is laid away snugly under the upper edge of the shell, passing over one foreleg.

The members of this Family present many anatomical exceptions to the regular order of form among tortoises and terrapins, and by some authors they are placed at the foot of the Order Chelonia. The shell is really very imperfect, the bones being literally few and far between, and the upper and lower shells are quite unconnected by bony structure. The feet are large and strongly webbed, but only the three inner toes are provided with claws. In habit these creatures are persistently aquatic, rarely going upon dry land, and they are both voracious and carnivorous. They live upon fish, fish-eggs, frogs, angle-worms, and small mollusks generally.

The Soft-Shelled "Turtle" [2] is perhaps the most common representative of this Family in the United States. It is found from South Carolina westward through the Gulf states to Texas; up the Mississippi to Indiana, Illinois and the Great Lakes, north and westward up the Missouri to the Rocky Mountains.



SOFT-SHELLED "TURTLE."
Aspidonectes ferox, from Florida.

I never shall forget those I encountered in central Indiana, when fishing with hook and line. The provoking Soft-Shells would persist in swallowing hooks that were not baited for them, and the difficulties we had in cutting off their leathery heads and dissecting out our hooks tried our patience very sorely. It was not until many years later that we squared accounts with this species. At Miami, Florida, fine large specimens were fried in batter, and eaten with great relish. When properly cooked, the shell of this reptile is tender, tasty and desirable.

[1] *Che-ly'dra ser-pen-ti'na.*

[2] *As-pi-do-nec'tes fe'rox.*

A large specimen has a shell 16 inches long by 14 inches wide, and weighs from 20 to 30 pounds. The upper surface is olive brown mottled with black, and underneath is clear white. On account of its widely palmated feet, these "turtles" are the most active swimmers of all the fresh-water terrapins and turtles. In North America this Family is represented by five species.

THE SEA-TURTLES.

The sea is so vast, it is but natural that we should look to it for the largest species of Chelonians. There is one character by which any one can recognize a sea-turtle, anywhere. The front limbs are developed as *long, flat, triangular flippers, without separate toes and claws, like the flippers of a sea-lion.*

Nearly all the sea-going Turtles are large, and one species is the largest of all living Chelonians. Without exception, all are habitants of tropical waters; but occasionally an individual is lulled into fancied security, and borne northward in the warm waters of the Gulf Stream until it wanders out of the track, and suddenly finds itself in the chilly arctic current. Then, benumbed with cold, it falls an easy prey to the first predatory fisherman who sails near it, and promptly lands in Fulton Market.

HARD-SHELLED SEA-TURTLES.

Chelonidae.

The Green Turtle[1] is the most important and valuable of the sea-turtles, and in the Atlantic it is the species that is most widely distributed. It is of large size, its flesh is excellent food, and wherever found it is regarded as a prize. It is said that sometimes it attains a weight of about 600 pounds; but those which now find their way to market in our large cities are steadily diminishing in size, and rarely exceed fifty pounds.

This turtle is found from Long Island down the Atlantic to Cuba, throughout the Gulf of Mexico, the Caribbean Sea, the West Indies, and on southward to Brazil. It is also found in the Indian Ocean, and is common on the coast of Ceylon. I should say that on our coast Key West is its centre of greatest abundance and maximum size. The favorite haunts of this creature are in the shallow channels that lie between the keys, where they find quiet waters and plenty of food, but no security from the sharp eyes of the turtle-catchers. It feeds upon aquatic plants that grow on the bottom of shallow seas.

A large proportion of the Green Turtles captured on the Florida coast are sent north, by steamer and rail, to supply the ever-greedy and high-priced city markets from Baltimore northward.

And really, it is not surprising that the flesh of this animal is considered most excellent food, and much sought after, both for soups and steaks. It is tender, fine-grained, dark colored, not too fat and very agreeable in flavor. Moreover, this is a clean-looking animal, its shell is smooth, its head is small and neatly formed, and the front flippers are scaled, quite down to their extremities. The shell is of no commercial value.

The Hawksbill Turtle, or **Tortoise-Shell Turtle,**[2] furnishes the valuable tortoise-shell of commerce, and it is the most beautiful of all the Chelonians. Its name is derived from the strongly hooked beak which terminates its upper jaw. Its back is covered with a roof of very beautiful curved plates of tortoise-shell, overlapping like shingles, each scale terminating in a saw-tooth point. The scales are clear yellowish horn, beautifully mottled with black and brown.

This species is yet found occasionally around the Bahama Islands, where the sea is very clear, and the white-sand bottom is liberally garnished with sea-fans, corals, and other beautiful invertebrate forms. Its range as a whole is from the coast of southern Florida, the Bahamas and the Gulf of Mexico, southward through the West Indies to the Amazon. It also inhabits the tropical waters of the Old World.

Formerly it often grew to a weight of between twenty and thirty pounds, but it has been so persistently sought after, on account of the commercial value of its shell, that all those now seen in the markets are very small. The largest shell on record is 34 inches long. Another species is found on the Pacific coast, and it bears so strong a resemblance to its eastern relative that for a considerable period the two species were believed to be identical.

The Loggerhead Turtle[3] looks like a coarse

[1] *Che-lo'ne my'das.*

[2] *Che-lo'ne im-bri-ca'ta.*

[3] *Thal-las-so-chel'ys car-et'ta.*

and large-headed understudy of the green turtle. It is readily distinguished, however, by its massive head, and thick, heavy shell. It is a turtle of coarser quality every way than the green turtle, and sells at a lower price. Like its handsomer relative, it is widely distributed, but does not inhabit the Indian Ocean.

The flesh of this animal bears so close a resemblance to beefsteak that even a butcher cannot always detect the difference. One Christmas morning, at Key West, I dissected a large Loggerhead. The flesh was fresh, and very tempting, and when a choice lot of steaks were offered to the landlady of a certain small hotel, they were gratefully accepted.

It happened that the butcher who supplied the hotel with beef and mutton was a boarder thereat; and, as became his calling, he sat at the head of the long table, and served the meat. Although he was an able butcher, he had one weakness; and it lay in the fact he could *not* eat turtle-meat. It was "too oily," too "musky," and too far removed from beefsteak.

With no unnecessary announcements, the turtle-steaks were fried, *à la* beefsteak, and set before the butcher. He served them as beefsteak, ate his own portion with evident relish, and all the other guests ate theirs. The butcher had nearly finished his second instalment, without having discovered the substitution, when he was asked how he liked turtle-steaks, for a change.

The sandy beach on the east coast of Florida, along the Indian River Peninsula, is a favorite spot for both Loggerhead and green turtles to lay their eggs. Mrs. C. F. Latham, of Oak Lodge, ninety miles above Palm Beach, has made careful observations on the habits of these turtles. In the months of May and June, when the summer heat is becoming severe, on moonlight nights the turtles crawl up out of the water, dig holes in the sand high above tide-mark, from 15 to 18 inches deep, and in them lay their eggs, to the number of from 80 to 220. The period required for incubation is about sixty days. When first hatched the young are only $2\frac{1}{2}$ inches long, but the moment they emerge from the nest they start for the ocean.

LEATHERY-SHELLED SEA-TURTLES.

Dermochelydidae.

The Harp-Turtle, or **Lyre-Turtle,**[1] is the giant of the Chelonians of the present day. Sometimes it is called the **Leather-Backed Turtle.** I once dissected and preserved a specimen which weighed 740 pounds, and the oil and the toil of it are yet vividly remembered.

This remarkable creature has a very feeble bony shell, which is buried under a one-inch layer of fatty material which looks quite like the blubber of a whale. It is easily cut with a knife, and contains about a pint of oil for every square foot. The back of this strange creature is marked by five sharp ridges that run lengthwise, and are separated by concave, wave-like depressions. The front flippers are very long, and it seems quite certain that even in its native element this great animal is slow and clumsy. Its flesh is quite unfit for food.

This turtle is found very sparingly along the Atlantic coast from Long Island southward, but is abundant nowhere. One may travel all around Florida, and all through the West Indies without seeing even one specimen.

[1] *Sphar'gis co-ri-a'ce-a.*

Photographed and copyright, 1903, by R. J. Beck.

MARINE IGUANAS ON NARBOROUGH ISLAND. GALAPAGOS ARCHIPELAGO.

CHAPTER XXXVIII

THE ORDER OF LIZARDS

LACERTILIA

Of all the world's reptiles, the lizards are the most elusive, and the most difficult to know personally. With the exception of the large iguanas, monitors, and a very few others, the vast majority of the species are tiny creatures, lightning-quick in movement, and very much opposed to being caught.

And the little sprites are difficult to keep in captivity, beyond all other reptiles. Being children of the sun and sands, they demand quarters that are of desert dryness, roasting heat, and flooded with sunshine. Without these conditions they refuse to eat, and quickly die. If every student of lizards had a private desert which he could keep heated up to 100 degrees, a sun all his own to shine upon it sixteen hours a day, and meal-worms without limit, it would be quite possible to keep small lizards long enough to become well acquainted with them. Without such an equipment, the path of the student is beset with difficulties.

Because of these conditions, we will introduce here only a very few of what we may call the practicable lizards,—those which it is possible to know, and worth while to note.

General Character.—Most of the lizards are four-footed creatures, many have long, whip-like tails, and nearly all are covered with scales, mostly very fine. Sometimes the scales are large and horny. Quite a number of species are either partly or wholly covered with spines. The majority of lizards live upon the ground, or near the earth, but quite a number of species live in trees. Those called flying dragons possess parachute wings, and can fly as a flying squirrel does. Some of the legless lizards live in the earth.

Most lizards have teeth, but usually of a very simple character, setting in each jaw in a long and rather even row, like the teeth of a saw.

There are eighteen Families of lizards, provided with eighteen formidable names, and it is not possible to consider each one. For the present we will omit all references to the Families, and merely present a few examples which will illustrate the Order as a whole.

COMMON IGUANA.

The Iguanas are among the largest and most interesting of the Lizards, being surpassed in size only by the *Monitors*. In their food habits they are omnivorous. Although feeding chiefly upon vegetable food, many species devour birds and eggs with great avidity. In their habits they are partly tree-climbing and partly terrestrial. By reason of their saw-toothed backs they are so odd and showy they always attract attention. Were it necessary to select but one species to represent all the species of Lizards, that one should be the **Common Iguana**[1] of the West Indies, Central and South America. It is from 4 to 5 feet in length, in color it is an irregular

[1] *I-guan'a tu-ber-cu-la'ta.*

mixture of green, black and yellow, and it may be recognized at a glance by the row of long, slender, fringe-like scales which rise along the centre of its back. One good look at its extremely long and slender toes is enough to suggest the idea that it is a climbing animal. It makes its home in thick tree-tops, and feeds chiefly upon fruit and soft vegetation. I can testify that its flesh is palatable food, for in the hungry Orinoco country we ate it more than once.

Iguanas generally possess one good trait which is sufficient to forever endear them to zoological garden people. They are good-tempered animals, and never fight, no matter how many are placed in one cage, nor how many species of Iguanas are represented. Owing to the ease with which these creatures are captured, their price in New York is about $2 each.

The Marine Iguana,[1] or **Sea-Lizard,** of the Galapagos Islands, is a creature of gre-ga'ri-ous habits, which means the habit of flocking or assembling together in companies of noteworthy size. So far as we know, this is the only lizard which elects to assemble in companies of several hundred individuals. When Mr. R. J. Beck visited Narborough Island of the Galapagos group, in 1902, in quest of giant tortoises, he found on the clean lava-bed which formed the shore, a truly wonderful assemblage of Marine Iguanas. An area of at least three acres, destitute both of soil and vegetation, was literally covered by these reptiles, all wide-awake and fully interested in life, but serenely waiting for something to turn up.

Owing to their lymphatic temperament, and previous immunity from persecution by man, these strange creatures were quite tame, and willingly permitted Mr. Beck to make the photograph that is reproduced herewith. It represents one of the most wonderful views of reptilian life to be found anywhere on the earth to-day.

The Marine Iguana is a stockily built, dull-colored animal, about four and one-half feet in length, frugivorous in its habits, and very much at home in the water. It subsists almost wholly upon sea-weed.

The Rhinoceros Iguana,[2] of the same form as the preceding, but much lighter in color, and marked by half a dozen horny tubercles on the upper surface of its head and snout, is found in Hayti and San Domingo.

Leaving the large lizards, of which be it remembered there are many interesting species in the Old World,—called Monitors,—impossible to mention here, we reach the small lizards, of which there are a legion of species. The warm and dry countries of the world literally swarm with these tiny creatures, which dart over rocks and fences like streaks of green or brown light. If you try to catch one by its long tail, and close upon it, the lizard leaves its tail between your thumb and finger, as a souvenir, and gayly streaks away *to grow another,* without loss of time! The power possessed by lizards to reproduce a missing tail is one of the strangest things in animal growth; but it is to be observed that the second edition of a lizard's tail is far from being the shapely and perfect member that is seen in the first.

BLUE-TAILED LIZARD.

Many lizards, like much study, are a weariness to the flesh; and we will limit our exhibit to a very few prominent and interesting types which are well fitted to represent the entire group.

The Blue-Tailed Lizard[3] is not only a common species throughout a wide area of the United States, but it is also representative of a large number of species which resemble it. It is found throughout the eastern half of the United States, from Nova Scotia and Canada to Florida and the Gulf, westward in the South to Arizona, and in the North to Wyoming. It is often called the **Skink,** and **"Blue-Tail,"** and **Blue-Tailed Skink,** and in summer it is available for study

[1] *Am-bly-rhyn'chus cris-ta'tus.*
[2] *Met-o-poc'e-ros cor-nu'tus.*
[3] *Eu-me'ces quin-que-lin-e-at'us.*

purposes to a larger number of school pupils than any other lizard known to the author.

The colors of this creature vary with age to an extent that is apt to be very confusing. Observe the programme:

During the first year the body is black, with bright yellow stripes, and the tail is brilliant blue. In the second, the tail is slaty gray, and the black of the body is less intense. In the third, the body becomes brownish, and the stripes are indistinct. In the fourth, and thereafter, the body is brown, the head vermilion, and the stripes have disappeared. The length of a large specimen is about eight inches.

All the small lizards and skinks are insect-eaters, and in captivity thrive best upon mealworms and insects generally. Their quickness of movement is almost beyond belief, and even with a long-handled net it is very difficult to capture one alive and unhurt.

The Ring-Necked Lizard,[1] which should be called the **Kangaroo-Lizard,** represents a group quite different from the skinks, and also nearer to the iguanas. It is a creature of the canyons, deserts and dry mountains of the Southwest, from Texas to southeastern California, and northward into Utah and Nevada. It is often found on mountains up to 5,000 and even 6,000 feet. (Merriam.)

This is a plump-bodied creature, and its colors vary to an extent that is apt to create confusion. It is either dark green or bluish above, and the sides, back and thighs are covered with light spots. The under surface is yellowish-white, sometimes tinged wth pale green. This lizard derives its name from two bands of black which stretch across the shoulders between the fore-legs.

The most interesting feature about it appears never to have been observed and recorded until Mr. Barnum Brown sent several specimens to the Zoological Park. When one was liberated in a large sanded cage, it rose on its hind-legs, in the position of an erect kangaroo, and in that strange posture ran rapidly. It held its head well erect, carried its fore-legs *à la* kangaroo, and ran, not by hopping, but by taking long steps. In experimenting with the different individuals received from Mr. Brown, it was found that under similar provocation, all of them ran in the remarkable attitude described,—highly suggestive of a pygmy dinosaur.

[1] *Cro-ta-phy'tus col-lar'is.*

The Gila Monster[2] is perhaps the most famous lizard of North America, and its first name is pronounced *He'la.*

It is big, odd-looking and very showy, and therefore is dear to the heart of nearly every collector of reptiles. A large specimen has a total length of 20 inches, girth around the middle, 9½ inches, and weighs, 43 ounces. When in robust health, the body and tail seem stuffed to the point of discomfort. Externally the whole of the creature appears to be covered with round glass beads, jet black and orange yellow in color, and laid on in a Navajo pattern.

This remarkable lizard inhabits the desert regions of Arizona and the adjoining state of

From the Zoological Society Bulletin.

GILA MONSTER.

Sonora, Mexico. It is more sluggish in its movements than a box tortoise, and the very slow and clumsy manner in which it partakes of its daily meal of raw eggs and chopped meat leads the observer to pity its helplessness. How it manages to secure a sufficient quantity of acceptable food on the deserts where it lives is a puzzle.

Whether the bite of this creature is poisonous or not is yet a debated question among naturalists. Several authorities cite the deaths of various small animals bitten by it, but others point to other victims which were bitten, but did not die. At the United States National Museum, Mr. A. Z. Schindler was bitten by a Gila Monster, but aside from a very natural degree of irritation

[2] *Hel-o-der'ma sus-pec'tum.*

and soreness of the wound during two or three days, he experienced no permanent ill effects from it. It is quite certain that the bite of this creature is seldom fatal to man, even if it ever is; but it can cause the death of small and weak creatures, like frogs and guinea-pigs.

This reptile lives well in captivity, and half a dozen of them in a desert cage make a very showy exhibit.

The Horned "Toad,"[1] so dear to the heart of every eastern traveller on his first visit to the great Southwest, where deserts are plentiful and cheap, is not a "toad" at all! Observe its long *tail*, such as real toads never have, then call it forever after by its real name—**Horned Lizard.** There is much excuse, however, for the universal name; for, saving the presence of the tail, the little living cactus is quite toad-like in its form.

Professor Cope recognized eleven species of Horned Lizards, any one of which, wherever found, will serve as well as another to represent this genus. They are all habitants of the deserts and arid regions, where cacti, cat's-claw, and other thorny things possess the land. They are frequently seen in the roads and trails of the Southwest, and are easily captured. If meal-worms are abundant, they are easily kept in

HORNED LIZARD.

captivity, on dry sand, in warm sunshine. The length of a large specimen is only 5½ to 6 inches; and, strange as it may seem, these odd creatures are related to the iguanas.

[1] *Phry-no-so'ma cor-nu'tum.*

No! **The Glass "Snake"**[2] does *not* join itself together again after it has once been broken in two. And it is not by any means a snake! It is a smooth-bodied, legless lizard, but so scaly,

GLASS "SNAKE."

and so snakelike in general appearance that any stranger is quite excusable for calling it a snake. As a matter of fact, the tail of this creature is so feebly attached to the body that a very moderate blow with a stick breaks the connection, and the reptile lies in two pieces. If left until doomsday, the severed parts will not reunite, but the body does its utmost to repair the injury by growing another tail. As a mater of fact, the new growth of tail is but a short and very imperfect substitute.

This creature inhabits the southern states from the Carolinas westward to Texas, and northward up the Mississippi valley to Kansas and Wisconsin. It feeds chiefly upon insects, and being quite without legs, it forms an excellent connecting link between the lizards and serpents. There are quite a number of species of legless lizards.

[2] *O-phi-o-sau'rus ven-tral'is.*

New York Zoological Park.

TWENTY-TWO-FOOT RETICULATED PYTHON (DEAD).

CHAPTER XXXIX

THE ORDER OF SERPENTS

General Characters.—A serpent, commonly called a "snake," is a very slender, long-bodied, legless reptile, cold-blooded, covered with scales, and breathing air. It moves by a sinuous motion, in which the scales under the body grip the earth, while the extension of the body muscles push the body forward. To afford a good hold upon the earth, the abdominal scales are very broad, set crosswise with the body, and the rear edge of each scale is free and sharp, like a blade.

The backbone contains a great number of vertebrae, sometimes nearly 300, and there is one for each crosswise scale under the body. There are also a great number of ribs, but the tail vertebrae are of course without them. The ribs are quite loosely attached to the vertebrae, in order that they may have the very free play that is absolutely necessary to the life of a serpent.

The head is usually flat and broad, and entirely covered with scales. The jaws are long, and well armed with long, sharp-pointed teeth, which point backward, in the direction of the throat. There are no molars for masticating food, and therefore all food is swallowed whole. Excepting in the injection of poison, the only function of the teeth is to seize and hold fast the serpent's prey while it is being swallowed. Poisonous serpents have special teeth, called fangs, for making deep wounds and filling them with poison. These are set in the roof of the

mouth, well forward, and while not in use they lie up against the roof of the mouth. The tongue of a serpent is very extensible, and capable of being thrust out fully half the length of the head. Its greatest use is in examining food, or possible food. From the fact that when travelling the tongue is so frequently thrust out, even when there is no excitement, it seems highly probable that it is used to detect vibrations in the air. (R. L. Ditmars.) The tongue is forked, and being entirely harmless, its sole use in defence is to threaten and intimidate its enemies.

The lower jaws are loosely attached to the skull, and to each other at their front end, by ligaments so elastic that when prey is being swallowed, the gape expands to enormous proportions. Mammals, birds and fishes to be swallowed are always seized head first, in order that the limbs, and also the feathers or scales, if there be any, will lie snugly against the body. Frogs and toads are usually taken hind feet first. The lower jaw is forced forward and over the animal, always one side at a time, as far as it will go; and when the teeth are inserted, that side is drawn back. The upper part of the head slides forward as far as possible, one side at a time, to match the lower jaw. Sometimes it seems as if the lower jaw will be torn loose from the head. Often after an animal has vanished, the jaws are a bad misfit, and do not come back into shape for half an hour.

The skin stretches like India-rubber, and over a heavy meal the scales are widely separated. The manner in which serpents feed in a wild state is certainly one of the most cruel processes of Nature.

The eyes of a serpent have no lids, and the eyes never close; but they are protected by a thin and perfectly transparent section of the outer skin, or epidermis, which is shed and renewed periodically.

The epidermis, or outer skin, is completely renewed about three times per year. To free itself from the old skin, the serpent usually crawls through a small aperture, the edges of which catch the old skin at the head and hold it fast while the owner crawls out of it. The first intimation of an impending change of epidermis is found in the dull appearance of the eye, over which a glassy film seems to be forming. Strange to say, even the eye sheds its outer surface, and emerges clear and brilliant. Most snakes shed their skins about three times a year.

A serpent is always most beautiful immediately after it has shed its epidermis, for then its colors are brightest and most iridescent. In captivity it often happens that the atmosphere in which a snake lives is not sufficiently moist to enable the old skin to loosen and be cast off. In such cases, if the serpents are non-venomous species, the owner must moisten the old skin, and peel it off by hand, or with forceps.

Reproduction.—Some snakes lay eggs, with soft, tough shells, that are hatched by the sun. A serpent which develops in an egg of this sort is provided with a special, temporary tooth, set on the tip end of its jaw, with which it easily punctures the shell sufficiently to escape. Others do not develop eggs with shells, but instead retain their eggs in their own bodies until the young are fully developed. Finally they are brought forth, each fully enclosed in a thin, membranous sac, which the little serpent quickly bursts. Snakes that lay eggs are called *o-vip'-a-rous*, and those that bring forth their young alive are called *vi-vip'-a-rous*.

Although serpents are cold-blooded animals, they reach their highest development in warm latitudes, and in regions of arctic cold they do not survive. In the temperate zone and the tropics, Nature has fitted them for life upon the ground, in the water, and in the tree-tops; and they inhabit swamps, uplands and deserts. They live under stones and logs, in hollow trees and stumps, and in holes in the earth; and they seldom attack man wilfully, and without provocation.

Food of Serpents.—In a wild state, snakes feed chiefly upon frogs and toads, fish, other snakes, small birds and mammals. Large serpents feed upon mammals of all sizes, up to small deer and goats. Water-snakes feed chiefly upon fish and frogs. Land species find frogs, toads and small lizards their cheapest prey, but the extent to which snakes feed upon each other is quite surprising. For example, the king cobra,[1] a large, athletic, and very deadly land-serpent of the Malay Peninsula, feeds exclusively upon other snakes and lizards, and while a greedy feeder upon what it prefers, it persistently refuses all other food. During the three years that

[1] *Na'ja bun-gar'us.*

one of these serpents has been kept in the Zoological Park, it has persistently refused to eat any of the moccasins or rattlesnakes which have been offered to it.

This fine specimen, which is nearly 11 feet long, became, toward the end of its first winter, so difficult to provide for, when the special supply of food-snakes had become well-nigh exhausted, that Curator Ditmars and Keeper Snyder tried a novel experiment. They killed a six-foot snake, stuffed it with frogs to the number of half a dozen, then offered it to the cobra. It was immediately accepted, and devoured in good faith; and since that time the experiment has often been repeated.

A large collection of captive reptiles requires many different kinds of food, and plenty of it. It is not necessary that food should be given alive. Very naturally, a serpent cannot swallow a bird or a mammal which is stiff in death, and unyielding. Swallowing is not possible unless the legs or wings are folded very closely against the body. All that a serpent requires is that the animal be offered while yet warm, and before *rigor mortis* has set in. The practice is to kill the food in the Reptile House, and offer it immediately afterward, while it is yet warm.

During the year 1902, the Reptile House contained 33 Crocodilians, 112 Lizards, 134 Chelonians, 381 Serpents, and 112 Amphibians, and the animal food they consumed during the year was as follows:

3,550 Rats and Mice,	512 Guinea-Pigs,
1,456 English Sparrows,	About 18,000 Meal-Worms,
624 Small Chickens,	About 25,500 Live Fish,
208 Large Chickens,	About 2,000 Toads,
210 Pigeons,	About 2,000 Frogs,
1,300 Eggs,	About 2,500 lbs. Vegetables and Fruit.
272 Rabbits,	

Classification of Serpents.—Unfortunately, it is impossible to offer the general student a diagram of the Families of living serpents, based on the highest scientific authorities, which would be either simple or understandable. The species are many, and their teeth, scales, bones and other features are diversified. Thus far no scientific authority has succeeded in dividing the world's serpents into logical groups without basing the divisions upon anatomical features, and describing them in technical terms which only the special student of reptiles can understand.

By way of example, take Professor Gadow's simple statement of the distinguishing characters of the Family *Colubridae:* "ectopterygoids are present: the squamosals are loosely attached to the skull, and carry the quadrates, which are not reached by the pterygoids: the prefrontals are not in contact with the nasals; the maxillaries are horizontal, and form the greater portion of the upper jaws: the mandibles lack the coronoid process or element: both jaws are toothed."

Under the circumstances, our wisest course will be to select and set forth a series of small groups of serpents which will introduce the species most worth knowing, and at the same time convey a fair amount of general information regarding serpents as a whole.

Popular Questions and Misapprehensions.—Regarding the habits of serpents there are many unsettled questions, and many disputes. The perennial "Hoop Snake" delusion, for example, will not down, and probably it never will lack exponents and defenders.

The question "Do snakes swallow their young?" is also a perpetual storm-centre; and there is plenty of reliable evidence on all sides of it.

Snake disputes between truthful persons are due either to deceptions of the eye (*an organ easily deceived!*), a misinterpretation of things seen, or imperfect observations.

For example, men of the highest truthfulness have been deceived into the fixed belief that they have "*seen* horse-hairs turn into worms."

Without attempting to settle out of hand any of the snake disputes that are "rock-ribbed, and ancient as the sun," I will at least state what experienced men, who have observed and studied reptiles all their lives, and gathered facts regarding them, *believe to be true.*

The "Hoop-Snake," which is said to travel by taking the end of its tail in its mouth, and rolling along like a hoop, is believed to be an absolute myth.

It is believed that snake mothers do *not* swallow their young in order to protect them, and emit them all as good as new, when the danger is over.

Many snakes do hiss, some of them as loudly as a red-hot poker thrust into cold water.

The tongue of a snake is not capable of in-

flicting a wound, nor of conveying poison into the blood of another creature.

Snakes never are "slimy."

Removing the fangs of a poisonous serpent does not necessarily render it harmless; for new fangs promptly grow out to take the place of those removed.

The rattle of the rattlesnake contains more than one joint for each year of life,—usually two or three.

THE LARGEST SPECIES OF SERPENTS.

Family Boidae.

The Family *Bo'i-dae,* containing the boas, anacondas and pythons, embraces between sixty and seventy species.

It is as natural for human interest in animals to be greatest toward those that are the largest of their kind, as it is for sparks to fly upward. It is well to see what Nature can do when she puts forth her best efforts. No one need apologize for a keen interest in pythons, boas and anacondas, provided that interest is kept down to bed-rock truth, and all exaggerations and overestimates are rigidly eliminated. Unfortunately, however, the makers of sensations about wild animals regard all large serpents as their lawful prey, and often stretch them unmercifully.

New York Zoological Park.

BOA CONSTRICTOR.

The Boa Constrictor.—The serpents which seize their prey, and crush it into compact shape before swallowing it, are *constrictors,* because of their method; but all big serpents are not necessarily *Boa* constrictors. That title applies to but a single species, found in South America; and, curiously enough, its Latin name is also its popular name.

In seizing its prey, this serpent instantly reveals its name by its method. The jaws open widely, fly forward with electric quickness, close on the animal, and hold fast. Instantly thereafter, a coil of the body near the head is flung completely around the victim and drawn tight, to suppress struggling, and prevent possible escape from the jaws. From the oldest and largest to the youngest and smallest Boa Constrictors, all seize their prey with precisely the same action, and the flinging of the first coil follows so quickly after the strike of the jaws that the two acts seem almost simultaneous.

The Boa Constrictor is much smaller than its neighbor, the anaconda, and not more than one-half the size of the gigantic reticulated python of the East Indies. Its maximum length is about 12 feet. It inhabits South America, from the Caribbean Sea to Paraguay, but only in forested regions, where animal food is plentiful, and cover for concealment is abundant. This species is readily recognized by its bright, reddish-brown tail, which is much more highly colored than the head and body. It is also marked by the prevalence of reddish, iron-rust brown in its color-

scheme, and the very large oval patches of light color, divided by black bands, that are laid along its back with regularity and precision. The sides are beautifully marked by light-colored diamonds and bars.

When at home, this serpent feeds upon pacas, agoutis, capybaras, tamanduas, young peccaries and tapirs, and any bird that is large enough to justify attention. Considering the excellent climbing powers of the Boa Constrictor, and the dulness of certain South American monkeys, it is highly probable that monkeys furnish many a meal for this serpent. The sloth is protected in two ways. It prefers the small and weak outer branches of a tree, and it moves so slowly and unostentatiously a Boa would be long in finding one.

If a twelve-foot Boa once wrapped itself around an unarmed man, it undoubtedly could suffocate him, or crush him to death, but it would be impossible for it to swallow him. There is at hand no authentic record of a Boa Constrictor ever having killed a man or a horse. In South America I was assured by native hunters that Boas and anacondas swallow antlered deer, but when direct proof of this was called for, it never came.

The Anaconda[1] is the great water-constrictor of South America, and it so loves the aqueous element that some captive specimens never leave their bathing-tanks unless forced to do so. This serpent is strongly marked for identification by the very large black spots, round or nearly so, which cover its back from head to tail, laid on a dark olive ground. Sometimes these are arranged in pairs, and suggest dumb-bells.

This species attains very great size, and being fully equal to the reticulated python of the East Indies, it is one of the largest of living serpents. Of course it can hardly happen that specimens of the largest size would find their way into zoological gardens. The largest thus far exhibited in the Zoological Park measured 18 feet 6 inches, and came from the Berbice River, British Guiana. In the British Museum there is a stuffed specimen which is 29 feet long.

In British Guiana I was assured by local hunters that the "Camudie," as this serpent is commonly called, often attains a length of 35 feet. There is, however, no proof that it exceeds 30 feet; and any traveller or observer who has the good fortune to meet with a specimen exceeding that length will do well to back up his tape measure with either the preserved skin or skeleton. One snake-skin is more convincing than a hundred snake-stories.

I believe the delta of the Orinoco is the northern limit of the Anaconda, where it is called the "Culebra de Agua," and regarded with profound respect. It inhabits the Guianas and Brazil, and probably extends to the head-waters of the Amazon, in eastern Peru. Of its regular food, the capybara (a water-loving rodent, as large as a good-sized hog) undoubtedly stands first, followed by the tapir, otter, deer and large water-birds generally.

The Reticulated Python,[2] of the Malay Peninsula, Sumatra and Borneo, is the largest

YELLOW ANACONDA.
Eunectes notaeus.

serpent of the Old World, and the only rival of the anaconda for first place. A surprisingly large number of specimens of this species are captured alive each year, and sold to dealers in wild animals. As a result, the largest serpent with which the animal-loving public becomes familiar in the zoological gardens and parks is this handsome Python. Specimens exceeding 20 feet in length, and running up to 25 feet, are really common in the possession of the animal dealers of Singapore, but about three-fourths of them die from lack of proper care before they are finally disposed of in Europe or America, and placed on exhibition.

The largest specimen which thus far has died in the Zoological Park measured 22 feet 10 inches, and weighed 170 pounds; but a larger unmeasured specimen is now living there.

[1] *Eu-nec'tes mu-ri'nus.*

[2] *Py'thon re-tic-u-la'tus.*

This splendid Python is at home in the hot and moist jungle which from Burmah to Java covers the land with a dense mantle of trees, thorny palms, rattans and tangled underbrush.

The temperature is practically stationary all the year round, and varies little save between 82° and 98° F. The frequent rains, and the moist, hot-house air of that region, with abundant animal food and ample cover, constitute ideal conditions for the rapid growth of reptiles, and the triennial shedding of their epidermis. It is no wonder that Pythons and king cobras grow large there, or that they are so numerous that many of the former are caught alive by the Malays.

But the term "numerous" is capable of several interpretations, and in this case we enjoin a strict limitation. Although between forty and fifty Pythons of two large species[1] leave Singapore every year, let it not for one moment be supposed that anywhere in the East Indies are these serpents so numerous that they constitute a danger to human life, or that it is even possible to find them by hunting for them. Quite the contrary.

I spent several months in the Far East, roaming through jungles of all kinds, some of them so dense and so full of deadly bogs and miasma that now I recall them with a shudder. I never once found a wild Python, great or small; nor a cobra, even in cobra-ridden Hindustan; nor did any of my own native followers ever find a specimen of either for me. The only wild Python I ever saw or handled in its home jungle was one that was brought to me in the Malay Peninsula. It was hiding in a hollow tree, and when it looked out at a Malay who was passing, he whipped out his parong, cut off its head at one blow, and came to me calmly dragging behind him twelve feet of dead snake.

So far as I could learn, even the largest Pythons are harmless to man. They sometimes visit native villages, crawl through the frail fences which very feebly protect the domestic animals, and swallow—chickens and ducks! It is in these humble raids that some Pythons come to grief by being caught alive. But jungle people have no fear that a Python would make such a blunder as to attempt to make a conquest of a man. To be sure, in the Far East, people do not often go poking around in the jungles at night, in thick darkness. It is not considered the proper thing to do so.

The food of the Pythons of the East Indies must consist chiefly of the muntjac, hog-deer and other deer of small size; young wild pigs, pheasants and jungle-fowl. Our captive Pythons prefer large chickens—full-feathered—and rabbits. A Python should voluntarily eat a full meal every two weeks.

Until quite recently it was generally believed that if a large serpent would not feed voluntarily there was nothing to be done for it save to watch it commit suicide by starvation. Two years ago, Mr. Raymond L. Ditmars, Curator of Reptiles in the Zoological Park determined upon a very bold experiment. He decided that a starving twenty-foot Python should be fed artificially. Accordingly, a smooth bamboo pole was procured, and a string of four rabbits was tied up so that the pole would thrust the first one far into the serpent's interior, and drag the others after it. The next question was, how could the snake be controlled?

Summoning Keepers Snyder and Dahl, and five other men, the cage-door was opened. As the reptile raised its head to strike the intruders, a stream of cold water from a hose struck it full in the face. When it recoiled in confusion, the plucky keepers seized it by the neck, and quickly dragged it from its cage. As its form emerged, the waiting men seized it at proper intervals, and held it nearly straight.

The Curator presented the pole-strung rabbits, the first of which was angrily seized in the Python's jaws. With this auspicious beginning, it was the work of only a few moments to gradually push the string of wet rabbits down the serpent's throat, to a distance of seven feet, and withdraw the pole. Finally the tail and body of the snake was thrust into the cage, and with a careful toss from the hands of Mr. Snyder, the head landed on the coils, sufficiently distant that the door could be closed without accident.

Since that time, all large serpents that fast too long are fed in this manner, and the food thus mechanically placed in the stomach is properly assimilated.

[1] The Black-Tailed Python (*Py'thon mo-lu'rus*), although smaller than the Reticulated, attains a length of 20 feet.

HARMLESS SNAKES OF THE UNITED STATES.

Of the grand army of harmless snakes inhabiting North America, the **King-Snake**[1] is unquestionably the king. It is also called the **Chain-Snake** and **Thunder-Snake.** It is the most courageous of all snakes, and in proportion to its size it is also the strongest. Toward man it is by no means especially vicious; but on the contrary, its manner is quite tolerant.

Toward all other serpents, however, it manifests as great aversion as any snake-hating woman, and it is pugnacious and aggressive to an astonishing degree. The King-Snake is, for its size, the most powerful of all the constrictors, and does not hesitate to attack a snake of another species several times larger than itself. It is cannibalistic in its tastes, and not only attacks and kills other snakes, but devours them.

In our Reptile House, a snake of this species once attacked a Cuban boa, fully three times its own size, and tried to swallow it! Had not the boa been rescued, it would undoubtedly have been quickly suffocated by the coils which its antagonist had wrapped tightly around its body. On another occasion a King-Snake that was placed for a very short time in the cage of the water moccasins, attacked one of the latter, wrapped around it, and killed it. Several times the moccasin bit its assailant, but the King-Snake is immune to the venom of serpents, and paid no attention to the counter-attack.

In some portions of the South, the King-Snake is believed to be a special enemy of rattlesnakes and moccasins, and on this account it is preserved from general slaughter. It is well attested that it does sometimes kill and devour snakes of both those species.

This bold serpent is found from Maryland to southern Florida, thence westward through the Gulf states to the Indian Territory, Texas and Matamoras, Mexico. Its average length is about 3½ feet, and it rarely exceeds 4 feet. From Maryland to Georgia it is a black snake with thirty white bands or rings around it, and is called the Chain-Snake. Farther south its body-color is greenish, with white rings, and is called the Thunder-Snake. Its favorite food is rats, mice, lizards, birds, and other snakes; but no frogs are eaten.

[1] *O-phi-bo'lus ge-tu'lus.*

It reproduces by laying eggs. In Texas, New Mexico and Sonora, Mexico, the *Splendid King-Snake* is found. In Arizona, California and Nevada occurs *Boyle's King-Snake,* a conspicuous black serpent, marked by thirty broad, cream-colored bands. The latter sometimes predominate so effectively as to give the snake a general cream-colored appearance, with black rings. An entirely black variety, without rings, is found in Indiana and Illinois.

The Corn-Snake,[2] sometimes called the **Red Racer,** is one of the handsomest serpents in North America. Its general color-tone is mottled yellowish-red, or reddish-yellow. In detail its color-pattern consists of about forty squarish blocks along the back, each of which is dull brick-red, with a deep margin of black, outside of which is a lighter ground-color. Its length is a little over three feet, and its form is slender and graceful.

KING-SNAKE.

Like the king-snake, this serpent is a powerful constrictor, a good climber, and seldom is seen on the ground. In the fields and forests, it is usually found in or upon low bushes. It frequents the habitations of man, and the roofs of old out-buildings are its favorite hunting-grounds for rats and mice. It is fond of rats, and because of this is considered a useful ally of the southern farmer, by whom it is often called the **Rat-Snake.** (Raymond L. Ditmars.)

[2] *Co-lu'ber gut-ta'tus.*

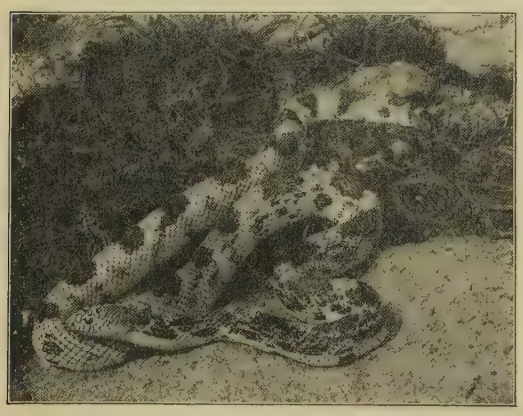
This serpent is courageous, but not particularly aggressive. Its food consists of rats, birds, eggs, small rodents, and warm-blooded creatures generally. In South Carolina, Mr. Ditmars captured a specimen which but a few minutes previously had finished swallowing a bob-white.

The home of this interesting and beautiful serpent is practically the same as that of the king-snake,—along the Atlantic coast from Maryland to Florida, and westward through the Gulf states to Arkansas. This snake is an egg-layer.

The Gopher-Snake[1] is our representative of the rat-snakes of South America and India, that make a business of catching rats in and around dwellings and out-buildings. In the South, it is often called the **"Black-Snake,"**—because it is black; but when it is particularly well polished, it takes on a gun-barrel blue appearance, when it is also called the **Indigo-Snake.**

This is a large and showy serpent, often attaining 8 feet in length, very docile and good-natured, and easily tamed.

At Oak Lodge, Florida, we once saw a very large wild Gopher-Snake emerge from the saw-palmetto jungle, and crawl directly toward the house. When Mrs. Latham was informed, she cried out reassuringly, "Oh, that is my pet snake! It keeps the place clear of rats." Forthwith she



PINE-SNAKE.

laid hold of it and picked it up, which the serpent did not resent in the least, even when it was passed from hand to hand for close examination. When finally released, it leisurely crawled under the house, quite as if nothing had happened.

[1] *Spi-lo'tes co'ra-is cou'per-ii.*

This is one of the best of all serpents to keep in captivity. In four years we have not lost a specimen by death, and Mr. Ditmars has one which he has kept in good health for eleven years. It is next in hardiness to the water-moccasin. It is an omnivorous feeder, and, named in the order of choice, its food consists of rats, mice, birds, snakes, eggs, frogs, fish, lizards and even raw meat! (R. L. Ditmars.)

The Gopher-Snake is not a constrictor, it does not climb frequently, and does not care for water except to drink. It is strictly a warm-country species, and inhabits our Gulf states, from Florida to Matamoras, Mexico.

The typical **Pine-Snake**[2] inhabits the sandy pine-woods along the Atlantic coast from New Jersey to Florida; but other species of this genus are found throughout nearly every other portion of the United States except New England.

This species is quite harmless, even to other snakes, but for all that, it is a powerful constrictor. It lays eggs, and feeds upon birds, small rodents, and eggs. In devouring eggs it has a very odd but intelligent trick. It swallows an egg whole, and after it has passed a few inches down the throat, where it forms a large swelling, the serpent lifts its head, elevates its back, and exerts downward pressure directly upon the egg until the shell breaks!

A striking peculiarity of the Pine-Snake is found in the structure of its epiglottis, first observed and described by Dr. C. A. White, by means of which the hiss of this creature is so loud and so well sustained that it is like the hiss of red-hot iron in water. The maximum length of this snake is about 7½ feet. Its ground-color is whitish, the head is spotted with black, and along the back there is a series of about twenty-four very large brown patches, margined with black. Sometimes these blotches of color take shape as bands. The abdomen is dull yellow, with blackish-brown patches.

The Black-Snake of the East is a serpent of narrow form, but wide distribution. Westward it changes color, and is known at first as the **Blue Racer,** and then as the **Green Racer.** Although its Latin name is *Za-me'nis con-stric'tor*, it is not a constrictor, it is badly misnamed, it is perfectly harmless to man, and its bite is never more than a mere scratch. It is very cowardly, and

[2] *Pit-y-o'phis me-lan-o-leu'cus.*

will leap wildly from the edge of a rock or a steep bank in order to escape. If cornered, it makes a fierce but often absurd fight, sometimes be-

WESTERN COACH-WHIP SNAKE, OR RED RACER.

coming so frantic that it bites its own body. (R. L. Ditmars.)

This snake is a good climber, swims well, and is active and quick in movement, but it has no real power to speak of. It is not an enemy of the rattlesnake, as many persons suppose, but it devours snakes that are smaller and weaker than itself. Its favorite food consists of small rodents, young birds, eggs and frogs, but it does not eat fish. It is a great destroyer of mice and moles, and deserves well of the farmer on that account.

The young differ in color from adult specimens, being slaty gray, with chestnut-brown saddles on the back. In the third year, these colors fade, and the snake assumes its adult color. Speaking generally, the black form of this species occurs nearly everywhere throughout the United States east of the Mississippi into New England. What is called the *intermediate color* is too widely scattered to be defined, while the *green-and-yellow* form is found from Nebraska and Louisiana westward to the Pacific coast, and from Puget Sound to San Diego.

The length of this snake, when adult, varies from 40 to 58 inches.

The Coach-Whip Snake[1] is closely related to the preceding species (both being members of the same genus), and has similar habits. It is even more slender than the black-snake. Its standard color is, toward the head, black or light yellowish-brown, fading out rapidly backward, until the tail becomes nearly white. But these colors vary exceedingly in widely separated localities.

This is a southern snake, and extends from Florida quite across the continent to California. In the far Southwest, its colors are so much suffused with pinkish it becomes the **Red Racer** (*Zamenis flagellum fre-na'tum*).

The Garter-Snake,[2] our oldest and most familiar friend among the snakes, is as harmless as a house-fly, and any one who exerts himself to crush one simply makes a pitiful exhibition of ignorance and folly. This is the most prolific and generally abundant snake in North America, and no amount of persecution seems to diminish its numbers to any noticeable degree. During the month of March, 1903, about 450 specimens were collected in and around the Zoological Park.

This serpent is viviparous, and sometimes forty-five are born in one brood. Out of a brood of thirty-eight born in our Reptile House, there was one double-headed specimen and three albinos. The standard length of this snake is from 24 to 30 inches, and one 36 inches long is a large specimen. Of the genus to which the Garter-Snake belongs, twenty-four species have been described, covering the whole of the United

COMMON GARTER-SNAKE.

States, and much contiguous territory. From the species named above, twelve tiresome sub-

[1] *Za-me'nis fla-gel'lum.*

[2] *Eu-tae'ni-a sir-tal'is.*

species have been evolved, which are of no interest whatever to the general student.

The Red-Bellied Water-Snake[1] is a highly colored variety of the common Water-Snake that merits special attention. It is the most showy and handsome representative of an interesting group of water-snakes, comprising about ten species, all of which are harmless, but very much in evidence in small streams and other bodies of water. They bring forth their young alive. They love to lie upon low bushes that overhang water, and bask in the sun. They are very suspicious, however, and when disturbed drop head first into the water, like a stream of oil running down. The way to catch them is with a wire noose on the end of a light pole about ten feet long.

New York Zoological Park.

RED-BELLIED WATER-SNAKE.

The species named above is widely known amongst the negroes of the Carolinas and other portions of the South as the **Copper-Bellied "Moccasin,"** and it is feared accordingly. To the negroes of South Carolina, all water-snakes are "Moccasins." The Red-Bellied is held to be very deadly, and its bite is said to be "fatal" unless counteracted with large doses of good whiskey! (R. L. Ditmars.)

Water-snakes feed chiefly upon small fishes and frogs. From the stomach of one Red-Bellied Water-Snake collected in South Carolina, Mr. Ditmars took three sunfish, one catfish, about a dozen tiny suckers and a crawfish. This interesting fish collection had filled the serpent so full it could hold no more. The species referred to is prominently marked by its shiny red belly, and rusty-brown upper surface. It is from 3½ to 4 feet long, and like all Water-Snakes, emits a disagreeable odor when handled. It inhabits the southern states generally, and extends northward into Illinois and Michigan.

The Common Water-Snake[2] inhabits all of the Gulf states and the Mississippi valley up to Iowa. In the New England states as far up as Connecticut, and also in the southeastern states and the Mississippi valley is found a subspecies called *Natrix fasciata sipedon.*

The Hog-Nosed Snake[3] is a serpent of many names and remarkable habits. It is often called the **Blowing "Viper," Spreading "Adder,"** and other combinations of "Viper" and "Adder," all erroneous. This is the snake that is such a bold bluffer, and often saves its life by pretending to be very fierce and dangerous. Instead of fleeing from an intruder, this creature comes straight forward, with savage determination, hissing and darting out its tongue, and pretending to be a serious proposition. It looks as ugly and deadly as any real viper. It inflates the skin of

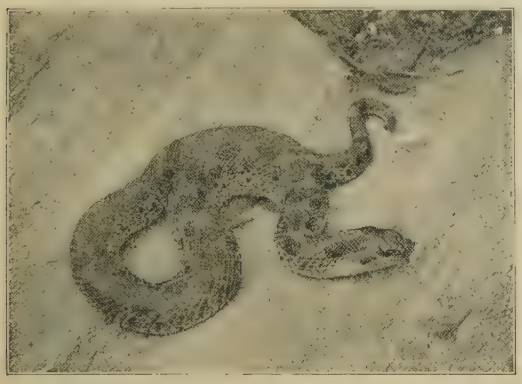
[1] *Na'trix fas-ci-a'ta er-yth'ro-gas-ter.*

[2] *Na'trix fas-ci-a'ta.*

[3] *He-ter'o-don plat-y-rhi'nus.*

its neck with air, and hisses until it can be heard twenty-five feet.

In spite of all this bluffing, however, the Hog-Nosed Snake is really a harmless creature. It strikes viciously, but always with its mouth closed! Mr. Ditmars says it is almost impossible to induce one of these snakes to bite. When greatly annoyed, or tickled on the back, it will



HOG-NOSED SNAKE.

turn over on its back, open its mouth, allow its tongue to hang out, and permit the experimenter to hang it over a stick, as if dead. If thrown upon the ground on its back, it will slowly turn back again, take in its tongue, and crawl away.

When a small boy I once had a thrilling encounter on a bare prairie with one of these snakes, which sought to take refuge in its hole while I fought it off with my hat. At last the snake fled, and I blocked up the mouth of the hole. While I was ploughing the next round, the snake returned, and with its nose dug a new opening running diagonally down into the old one, and entered.

This snake is flat-headed and thick-bodied, and varies in length from 30 to 37 inches. Its colors are a mixture of brown, yellow and black, with no definite pattern, and are almost impossible to describe successfully. This species lays eggs, which are about one and one-half inches in length, covered with a thick, tough, flexible shell. When hatched the young are from 7 to 8 inches long, and they hiss very soon after they emerge. The embryo serpent possesses an "egg-tooth," for cutting the shell of the egg, but it loosens and drops out within a day or two after the serpent is hatched.

THE POISONOUS SNAKES OF NORTH AMERICA.

Fortunately for us, all save one of our species of poisonous serpents are so peculiarly marked it is possible for any intelligent person to know them all, and recognize their dangerous character in a moment. This knowledge once acquired, all the other snakes of North America cease to be objects of dread or terror, and become merely so many interesting specimens of natural history.

A bird's-eye view of our venomous serpents reveals the following assemblage:

Venomous Serpents of North America.	Rattlesnakes, 11 species, Massasaugas, 3 species, Water-Moccasin, Copperhead, Harlequin Snake, Sonoran Coral Snake.

Out of the 75,000,000 people in the United States, probably not more than two die each year as the result of snake-bites. The number of timid people who are frightened by harmless snakes, each year, must be about 1,000,000. Now, if all the latter could be so fully informed as to be free for all time from *groundless* fear, what a relief to suffering nerves it would be.

And why should any one remain in ignorance? In reality, there are only five types to learn, all the rattlesnakes and massasaugas being referable to one group by reason of the rattles and "buttons" on their tails.

Come, then! Let us address ourselves to the very simple task of learning from a book how to recognize the venomous serpents of North America, as readily as one recognizes the dogs and horses of our next-door neighbor. Excepting the water-moccasin, they are all so plainly marked that all persons except those who are blind may know them; and there is no excuse for forgetting them. Instead of going into their anatomy at length, our efforts for this occasion will be concentrated upon their external characters, habits and homes.

Fortunately, we have not in North America any house-haunting serpents of great cunning and unfailing deadliness like the **Hooded Cobra,** or **Cobra-de-Capello,**[1] of India. The bite of this species is very deadly, and whether wholly guilty or not, in India it is debited annually

[1] *Na'ja tri-pu'di-ans.*

with the deaths of between 18,000 and 22,000 persons. It is said, however, that many persons are murdered on the sly, and their deaths are charged up to the account of the Cobra-de-Capello.

The reasons why so many persons are bitten by Cobras are, (1) that in the rainy season, the serpents take refuge in and about the huts; (2) that practically all the natives go bare-footed and bare-legged; (3) that many of them are compelled to go about at night, without lights of any kind, and (4) the warning of the Cobra—spreading the hood, and hissing—is more frequently given after the bite than before it! Moreover, the Cobra is naturally much more irritable and vicious than the rattlesnake, or any other American serpent.

Of all the serpents that have entered the Reptile House, the Hooded Cobras are the most vicious, and eager to do mischief. At the slightest excuse, they spring to an erect posture, spread their hoods, and try their utmost to bite. One of them struck the glass of its cage front so frequently that it brought on a disease of the jaw-bone, which finally rendered it necessary to remove one entire side of the lower jaw. To keep the three Cobras from seriously injuring their heads by striking against the glass, it is necessary to keep the lower portion of the plate painted white.

The Hooded Cobra is a slender-bodied, nervous and active serpent, with a maximum length of about 48 inches. When the rainy season is on in India, it seeks refuge in and about human dwellings, especially under floors, and is also partial to thatched roofs. For its bite there is no sure antidote.

The King-Cobra, or **Snake-Eating Cobra,**[1] of the Malay Peninsula is the largest of all venomous serpents, easily attaining a length of ten feet. It is a very athletic serpent, slender-bodied and strong-muscled, able to erect its head three feet, perpendicularly, and strike nearly a yard. It is a very expert and vigorous climber, swims nearly as well as a water-snake, and is a thorough believer in the survival of the fittest. It feeds only upon other serpents and lizards, but it would be better if harmless serpents fed upon it.

No matter where you find him, the **Rattlesnake** is a fair fighter, and entitled to far more respect than he is likely to receive in this snake-terrified world. He strikes only in self-defence, when he thinks he is about to be trodden upon. Instead of lying in ambush, and striking in deadly silence, like the cobra and the moccasin, he rattles loudly when man or beast approaches, and gives fair warning to "keep off!" He rattles to save himself from injury, and his persistent *whirr* has saved thousands of persons, and tens of thousands of domestic animals, from being bitten. A western cow-pony, a government mule, or a range steer will spring sidewise from a warning whirr in the sage-brush quite as quickly as man himself, and almost as far.

If Rattlesnakes generally (of which there are fifteen species) were disposed to be mean, and treat man as many human beings treat all serpents, the annual death-list from Rattlesnake bites would be a long one. Despite the few exceptional cases, however, it is a ruling fact that Rattlesnakes do not go pestering around camps, or frequently crawl under the blankets of men sleeping upon the ground. Every year thousands of cow-boys sleep on the ground, literally among these reptiles, without a single Rattlesnake accident.

Thanks to a long-standing acquaintance with this serpent, I have myself on numberless occasions "bedded down in the open" in Montana, Wyoming, Florida, and elsewhere, with not a moment's fear of snakes. Depend upon it, a Rattlesnake does not go about looking for trouble. His best efforts are devoted to the promotion of peace and longevity.

Beyond question, the Rattler is a serpent of timid and retiring disposition. It has not one-half the courage of the hog-nosed snake, nor a quarter of the cobra's vicious aggressiveness. If you encounter one at a fair distance, say ten feet, it will either crawl away, slowly and defensively, or coil and warn you to keep off. In its feeding habits, in captivity, it is one of the most timid and nervous of all reptiles, and seldom eats save when safe from observation and interruption. When darkness falls, and the Reptile House is entirely quiet, the Rattler bashfully swallows his freshly killed rat or guinea-pig.

My first experiment with a captive Rattlesnake, a huge Diamond Rattler from Florida, was to catch and place in its cage a live rat. The

[1] *Na'ja bun-gar'us.*

rat ran over the snake several times, and greatly annoyed it. The snake endeavored to get away from its disreputable associate, but in vain.

At last the rat flew at the Rattler, and bit him severely on the lips! This was too much to be endured. In a great rage the snake drew back, seized the body of the rat in its wide jaws, and *held on* while it drove its fangs through the tough skin of the rodent, and far into its body. After one could have counted ten, the rat was released; and thirteen minutes later it was dead.

Species of Rattlesnakes.

Fourteen valid species of Rattlesnakes are found in North America, one in South America, and there are none elsewhere. Our most prominent species are as follows:

ENGLISH NAME.	LOCALITY.	LATIN NAME.
Dog-Faced Rattlesnake	New Mexico	*Crotalus molossus.*
Timber Rattlesnake	Eastern half of United States	*Crotalus horridus.*
Diamond Rattlesnake	Florida and Gulf States	*Crotalus adamanteus.*
Texas Rattlesnake	The Southwest	*Crotalus atrox.*
Prairie Rattlesnake	The Plains Region	*Crotalus confluentus.*
Pacific Rattlesnake	The Pacific States	*Crotalus lucifer.*
Tiger Rattlesnake	Extreme Southwest	*Crotalus tigris.*
Horned Rattlesnake	Extreme Southwest	*Crotalus cerastes.*
Green Rattlesnake	Mexican Boundary	*Crotalus lepidus.*
White Rattlesnake	Southern and Lower California	*Crotalus mitchelli.*
Massasauga	Nebraska to New York	*Sistrurus catenatus.*
Edwards' Massasauga	The Southwest	*Sistrurus edwardsi.*
Ground Rattlesnake	Atlantic States South	*Sistrurus miliarius.*

Among the Rattlesnake species are several striking examples of color-development to suit their surroundings, or what is known in well-worn phrase as "protective coloration." The Banded or Timber Rattlesnake is a good imitation of the color of dead leaves and damp earth. The color-pattern of the Diamond Rattler is made up of rich though quiet tones of brown and yellow, dark and light, like the shadows of saw-palmetto leaves falling upon yellow sand. The Texas Rattler and the Horned Rattlesnake of the Southwest are so pale and bleached one instantly associates them with naked deserts shimmering in fierce sunshine.

In their habits, so far as known, the various species are very much alike. They bring forth their young alive, the normal number being between nine and fourteen. As soon as an infant Rattler bursts the thin transparent sac in which it is born, it is ready to coil and strike. Even at birth it is fully equipped with poison and fangs. Wild or captive, the favorite food of a full-grown Rattler is small mammals; but what they feed upon in a wild state when very young, remains to be ascertained. From our six species of captives, we have learned that Rattlers climb bushes with almost as much ease as professional tree-climbers, but in a wild state it seems fairly certain that they rarely do so.

The tail of the Rattlesnake is ornamented at the end with a rattle consisting of a number of joints of horny material developed out of the skin, one section dovetailed into another. The exact age of a Rattler is not indicated by the number of joints in the rattle at the rate of one for each year. On the contrary, under favorable circumstances about three joints will be developed each year, until the snake reaches maturity. We have now, in the Reptile House, Rattlesnakes three years old which already have in their rattles from seven to nine joints.

The rattles are not shed when an old skin is cast off, nor are they ever shed; but they are frequently broken off, usually about three joints each year after more than nine or ten joints have been acquired. It is very seldom that more than ten joints are found on a living snake.

It is possible to lengthen a snake's rattles, after they have been cut off, by joining on other joints of the same size, up to the number desired.

The slow vibration of a large set of rattles gives a sort of clicking sound, but when the wearer is thoroughly alarmed and angry, the spiteful "whirr" sounds like meat frying. The motion then is so rapid the eye cannot follow it.

Rattlers are not fond of bathing, but when swimming is necessary they swim well. The species which live in the North, pass the cold months in burrows below the frost line, either in the earth, or among rocks. If the situation chosen proves to be a cold one, the serpent becomes so torpid that it seems lifeless.

I once found a Prairie Rattlesnake abroad in northern Montana on October 10, two weeks after the first fall of snow. When brought to a realizing sense of its weakness and unworthiness, it crawled into a hole like a shallow post hole, and lay on the bottom completely exposed. This species is very wise in sheltering in the burrows of the prairie-"dog," but where none of those are to be found, the wash-out holes in cut banks can always be relied upon to furnish warm shelter for Rattler, bob-cat or wolf.

The Diamond Rattlesnake[1] is a royal serpent, the largest of the rattlers, and the handsomest snake in North America. A specimen 6 feet long, in good condition, will be accepted anywhere as a large one, but the largest specimens far exceed that size. At Oak Lodge, Florida, in the possession of Mrs. C. F. Latham, is the skin of the largest individual known to me. The wearer measured, before it was skinned, 8 feet 5 inches, and its girth at the thickest part of its body was 1 foot 3 inches.

This brown-and-gold species is most at home in Florida, on clean sand, among the cabbage-palmettos, saw-palmettos, and long-leafed pines. Although it rarely takes to water, it is sometimes called the **Water-Rattler.** It ranges northward into the Carolinas, westward through the Gulf states to the Mississippi River, and probably beyond. In Texas begins the home of the big **Texas Rattlesnake,**[2] of the same size and appearance as the Diamond, color-pattern and all, but of a very light color, as becomes a serpent of the arid regions.

New York Zoological Park.

DIAMOND RATTLESNAKE.

In captivity the Diamond Rattler is, like all members of its genus, a timid and erratic feeder. Unless all conditions are entirely to its liking—perfect quietness, choice food, and no one looking, it will not swallow a morsel. When its views on the subject of food and service have been fully met, it will partake of a young rabbit, a rat or a guinea-pig.

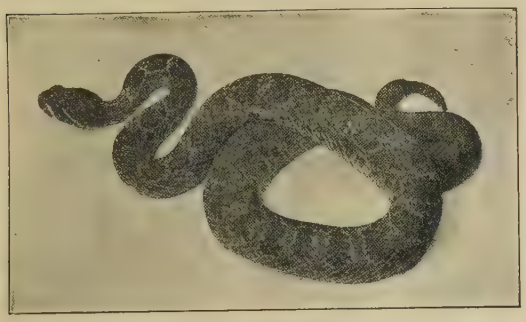
The Timber, or Banded, Rattlesnake[3] of the eastern United States shows a wide range in color, varying from a handsome sulphur yellow to brown, and finally to almost black. Young specimens are always lighter in color than old ones. One of the popular names of this creature

[1] *Cro'ta-lus ad-a-man'te-us.*

[2] *Cro'ta-lus a'trox.*

[3] *Cro'ta-lus hor'ri-dus.*

is derived from the broad bands of brown color which encircle the light-colored specimens. Often the hinder half of an adult or old specimen



PRAIRIE RATTLESNAKE.

has a black-velvet appearance. The length of a large specimen is 4½ feet.

This Rattlesnake has suffered more from civilization than any other species. Throughout many vast areas of rich and closely cultivated agricultural regions, it is now totally extinct. Although it is believed to exist within fifty miles of New York City, a living specimen would be about as difficult to find as a mastodon.

Originally the home of this species embraced the entire territory from the Atlantic coast to western Iowa, Kansas, and into Texas. In many portions of this region it still exists in small numbers, and is said to be "fairly common in the Allegheny Mountains," from Pennsylvania southward.

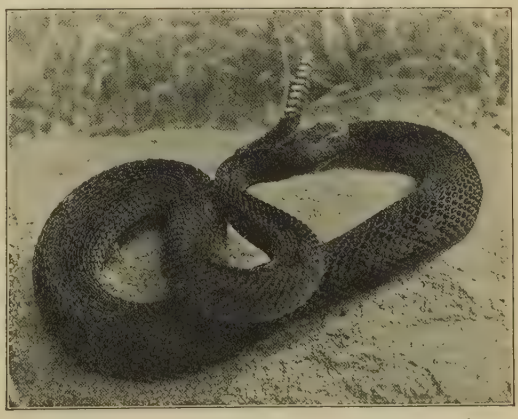
The Horned Rattlesnake, or Side-Winder,[1] of the far Southwest is a creature of the deserts, and the oddest member of this group. It has a small horn over each eye, and in crawling it moves sidewise, in very deep curves, totally different from the straightforward course of most rattlesnakes when on the war-path. This is the smallest of our rattlers. Its general color is yellowish-gray, marked by small round spots, and its home is in southern Arizona, California, Nevada, and probably Sonora, Mexico.

The Massasauga[2] is the type of a genus of rattlesnakes containing only three species, distinguished by various anatomical characters, but from neck to tail well marked, for the general student, by a succession of very dark brown saddle-bag patches of color laid upon lighter brown. The joints of the rattles never exceed ten in number. This species is found at long intervals from the swamps of western New York to Nebraska, but it is so rare that living specimens are difficult to obtain.

The Copperhead[3] is a rather short and small serpent, seldom exceeding three feet in length. Its colors look like two shades of copper—broad bands of old copper laid on a background of new copper. When the skin is new and fresh, or when a specimen has been reared in the shadows of captivity, this serpent is beautiful. Strangely enough, it is in some respects the direct opposite of its nearest relative, the water-moccasin.

The Copperhead is a serpent of the woods and rocks, and is not found in open grass lands. It is found from Indiana eastward (but not northward) to the Atlantic coast, and well up into New England. It ranges southwestward to

BANDED RATTLESNAKE. (YELLOW PHASE.)



BANDED RATTLESNAKE. (DARK PHASE.)

Texas, and in different portions of its home it is known as the *Pilot-Snake, Upland "Moccasin'*

[1] *Cro'ta-lus ce-ras'tes.*
[2] *Sis-tru'rus cat-e-na'tus.*
[3] *An-cis'tro-don con-tor'trix.*

and *Deaf "Adder."* It is decidedly poisonous, and its venom is second in virulence only to that of the rattlesnake.

MASSASAUGA.

In captivity, the food of this species consists of small mammals, young birds and frogs. It brings forth its young alive, and the usual number is between seven and nine.

The Water-Moccasin, or **Cotton-Mouth,**[1] is the ugliest snake in North America. Its body is about as lithe and graceful as a Bologna sausage, and its skin resembles the surface of sun-cracked mud. It is so ugly that stuffing it with tow does not make it look any worse. It has a piggish appetite for fish, but if no fish or frogs are handy, it eats other snakes. It is quite as ready to bite a friend as an enemy, and when Mr. Percy Selous was bitten by his "pet" Moccasin, he died in fifty hours, despite medical treatment.

The Moccasin is a southern snake, and it is a pity the species is not confined to Tierra del Fuego. It lives along the grassy margins of bay-

COPPERHEAD.

ous and swamps, and is most frequently found lying at the shore line, with its head and a small portion of its body out of the water. It is also much in the habit of lying upon logs, on bushes overhanging water, or in the vicinity of dried-up pools. When disturbed, it starts up, opens its mouth very wide, holds it open, moves its tail in slow vibrations, and stares wickedly at the intruder. It is the whiteness of the interior of the mouth that has given rise to the name of "Cotton-Mouth Moccasin."

This serpent does not coil itself in a round, tight coil, like a rattlesnake. As a rule, it holds its ground tenaciously, and does not retreat unless deep water is near. The fangs are shorter in proportion than in the rattlesnake, and the action of the poison is not so quick and violent as that of the rattler. But the bite must be taken seriously, and treated with the utmost vigor, if a fatal result is to be avoided.

This serpent attains an extreme length of about 5 feet, and a diameter of 3 inches. Usually,

WATER-MOCCASIN.

however, specimens are about 3½ feet by 2 inches. When adult, it is a snake *absolutely devoid of bright colors*, its scales being the color of dried mud, and very rough. The head is flat, the body thick and puffed out, and the tail is very blunt.

The young of the Moccasins are born alive, each one being enclosed in a thin, transparent sac, which bursts immediately upon reaching the outer air. The young are usually from 7 to 8 in number, but the last family born in the Reptile House contained 14. The young are strongly marked by light and dark bands, on account of which they are easily mistaken for young copperheads. They also resemble young hog-nosed snakes.

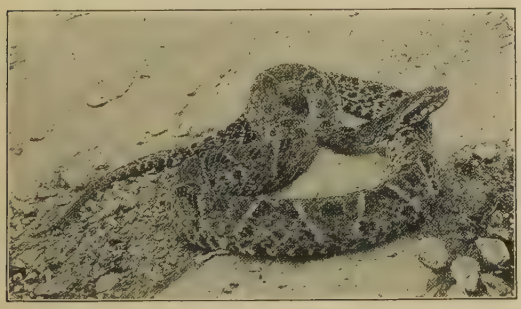
About the only redeeming feature in this serpent is the fact that in captivity it is very hardy. In four years, not one has died in our

[1] *An-cis'tro-don pis-ci-vo'ras.*

Reptile House. It is a serpent of the Gulf states, coming as far north as North Carolina and southern Illinois, and extending westward to Texas.

The Harlequin Snake[1] is a small, shiny, delicately formed serpent, of rather quiet habits and retiring disposition. It belongs to the same Family (*Elapidae*) as the deadly king-cobra of India! As far as it can be seen, it is instantly recognizable by the alternation of brilliant coral-red, yellow and jet-black rings which encircle its body from head to tail-tip. Unlike the broad-headed pit vipers,[2] the head of this serpent is no wider than its neck, and as a special feature, its head is quite insignificant in size, but is always crossed by a broad yellow band. It is well to remember from this species that *not all venomous serpents have lance-shaped heads.*

The range of this beautiful but rather stupid little serpent begins in South Carolina, and in-



FER-DE-LANCE.

cludes all the Gulf states southward and westward to the Pecos River in Texas. It ascends the Mississippi states to southern Indiana. It is a very persistent ground-dweller, and in captivity it spends three-fourths of its time buried in the sand of its cage, quite out of sight. It eats garter-snakes and black-snakes, voraciously. Although its bite is undoubtedly poisonous, I have never known of any one having been bitten. In fact, it is difficult to see how any one can be bitten by this serpent without having it done by special appointment.

The Sonoran Coral Snake,[3] of southern Arizona and northern Mexico, is in appearance much like the harlequin snake, and it is mentioned only because it is so little known, and to remark that it is a good subject for observation.

The Fer-de-Lance, or **Lance-Head Snake,**[4] is the serpent terror of the West Indies. It is a small snake, only about 6 feet in length when fully grown, and 2 inches in diameter. Its head is very wide, and it has very long fangs in proportion to its size. Its color-pattern strongly suggests the light phase of the timber rattlesnake—brown, with black markings. On two occasions that we know of, travellers returning from the West Indies have brought with them in pasteboard boxes, as indifferently as if they were frogs, living and healthy specimens of this venomous creature! One specimen was brought to us by a lady and her child, for identification; and the keepers of reptiles shudder even yet when they think what might easily have occurred.

Fortunately, this serpent is not particularly aggressive, or hostile toward those about it. When it seizes its prey, however, it buries its fangs, and holds on determinedly. A female specimen in our collection gave birth to twenty-four young, but they one and all refused to eat, and failed to survive.

SNAKE-POISONS AND THEIR TREATMENT.

The Rattlesnake's defensive equipment of fangs and poison has been perfected by Nature with as much care as the horns of hoofed animals, or the defensive armor of an armadillo. The ordinary jaw teeth have nothing to do with the poisoning process, and wounds from them would prove fatal only under exceptional conditions.

The venom of a serpent is a rather thick fluid, secreted in two glands that are situated on the side of the upper jaw, under the skin, behind the eye. In the stomach of an animal it is supposed to be harmless, and we know that in many cases it is so. To produce death, it must be injected into the blood, by a method that is practically instantaneous, and very effective. First there must be a puncture, then the injection of the poison.

To pierce the skin and flesh, the rattlesnake has two special teeth, called *fangs*, which are very long, slender, slightly curved, and exceedingly

[1] *E'laps ful'vi-us.*

[2] So called because of the existence of a round and deep pit on the side of the head, about half way between the eye and the end of the nose. In the rattlesnakes this character is very noticeable.

[3] *E'laps eu-ryx-an'thus.*

[4] *Bo'throps lan-ce-o-la'tus.*

sharp at the point. A slender tube traverses the axis of the fang, from the root almost to the point, for the passage of the venom. Around each fang is a flexible sheath of tough, white skin, evidently for its protection.

The fang of a diamond-backed rattlesnake—the largest species—is about an inch in length. The small bone in which it is set at the root (maxillary) is so hinged by tough ligaments attaching to the roof of the mouth that it has some freedom of motion. When the jaws are closed, the fangs lie against the roof of the mouth. When the serpent strikes an enemy with the intention of poisoning it, the mouth is opened widely, the pterygoid bone pushes hard against the maxillary, and the sheathed fangs are thrown forward until they look like great hooks of white skin.

A serpent cannot be rendered permanently harmless by the removal of its fangs, because the fangs are *constantly renewed.* Each operating fang is backed up by a series of smaller ones, of different sizes, growing and awaiting their turn to do duty, and drop away. An adult fang is shed every six or eight weeks. The old tooth does not drop out until the new one is close beside it, duly connected with the poison gland, and ready for duty. Then the old fang either drops out, or is left sticking in the next animal bitten.

Even if fangs were pulled out, the poison sac would remain, and a scratch from the jaw teeth, duly poisoned, would endanger the life of the patient.

In striking to do mischief, the function of the lower jaw is to get under the part to be bitten, and press it up firmly against the attack of the fangs. The mechanism by which the fangs are thrown forward consists of a series of levers, and the special student will be greatly interested in the published drawings which illustrate its details. It is admirably shown in "Amphibia and Reptilia," by Dr. H. Gadow.

Effect of the Poison.—It is obviously impossible in a work of this nature to enter into this subject at length. In lieu of this, we will offer a very brief digest of what we believe to be absolute facts. These have been gleaned with care from several sources, but I make special acknowledgment to Dr. Leonhard Stejneger's presentation of the subject in his admirable monograph on "The Poisonous Snakes of North America."[1]

There are two ways for the introduction of snake-poison into the system of a warm-blooded animal: (1) *through the blood,* by direct connection with a vein or artery, and (2) *through the skin and muscles,* one or both.

Although some of the great investigators differ somewhat on this point, it now seems reasonably certain that the manner in which snake-poison acts is by *paralyzing* the circulation of the blood, the breathing organs, the nerves, and even the digestive organs. The effect on the blood is a decrease in the strength and rapidity of the flow. In the nerves (after the first period of excitement), drowsiness ensues, which in fatal cases often lasts until death. The breathing is gradually diminished in strength and volume. The brain is usually the last organ to succumb. Dr. Stejneger's conclusion is that "the death which follows the introduction of the venom into the circulation must be attributed to gastro-intestinal apoplexy, and the stupefying action exercised directly upon the nervous system."

Venom introduced directly into the blood acts with great rapidity. When introduced hypodermically, through the skin and muscles, its action is much slower, and if the case is treated with great vigor from the very start, the patient has a fair chance to recover. Except from cobra bites, very many do recover.

The most dangerous snake bites are those inflicted upon the neck or face. The least dangerous are those upon the feet, the legs below the knees, and the hands and forearms.

Treatment with Anti-venomous Serum.—During the past fifteen years the whole outlook in the treatment of venomous snake-bites has undergone an important change for the better. Thanks to the enterprise of the Government of Brazil (a land of many poisonous serpents) the development, by Dr. Vital Brazil, of rattlesnake serum has robbed the rattler, the copperhead and moccasin of one-half their former terrors. For ten years none of the precious Brazilian serum was procurable anywhere in the United States, save at the New York Zoological Park. But the world progresses. Thanks to the energy and persistence of Mr. R. L. Ditmars, the development

[1] Government Publication. For sale by the Bureau of Public Documents, Washington, D. C.

of serum in the United States, made from North American venomous serpents, has at last been placed on a sound business basis. At this moment the industry is being established by several producers and agencies, on a commercial basis sufficiently broad that all of the thousands of persons who wish to arm themselves with sealed tubes of the liquid serum, and keep it on hand for a year if necessary, can do so at a total expense so small that no one desiring it will hesitate about the cost.

The H. K. Mulford Company, of Philadelphia, now (1927) announces that their "Antivenin," as made by their Antivenin Institute at Glenolden, Pa., "can be purchased through druggists everywhere," but particularly from their (Mulford) branches in New York, Chicago, St. Louis, Seattle, Kansas City, San Francisco, Atlanta, Boston, Norfolk, Columbus, Ohio, Dallas, and Los Angeles. The price is $7.50 per tube, and each tube has with it a hypodermic needle, and directions.

Outfit.—The following is a fairly complete outfit for a surgeon, traveller, community head, or private individual, and the cost is small:

A hypodermic syringe, a scalpel, a bandage roll for ligature, a jar of permanganate of potassium crystals, tubes of anti-venomous serum, some strychnine tablets, a small flask of brandy or whiskey, and some outside bandages.

In procuring serum for a snake-bitten patient, apply at a large drug-store, or telegraph to the nearest depot of supply and request that two tubes be delivered to the conductor of the first express train available, with a request to deliver it at the trainside in your station to your messenger, *who will be waiting.* This plan saves life; and thus far no conductor ever has failed to respond.

Treatment for Snake-Bite.—

1. If medical aid is within reach, speedily procure the best available.

2. With a clean knife or scalpel cut through the wound, and make it bleed freely.

3. Wrap a ligature around the arm or leg above the wound to impede the flow of poisoned blood to the veins of the body; but from time to time the ligature must be loosened to permit a limited circulation of fresh blood, or else mortification will ensue. The pain from a too-tight ligature is great.

4. If anti-venomous serum is at hand, inject it according to the directions that come with it.

5. If the serum is not available, wash the wound thoroughly with permanganate of potash crystals dissolved in water until it reaches a deep wine color; then with the syringe inject that permanganate solution into the wound, quite to the bottom of it. *This is the next-best remedy to the serum.* Freely wash the wound with it.

6. If great weakness or giddiness develop, then in leg or arm give hypodermic injections, every 20 minutes, of 15 to 20 minims of liquid strychnine, made from the tablets, "until slight tetanic spasms appear." (Stejneger.)

7. If the patient is about to sink into coma, give whiskey or brandy in small doses, but *not* in great quantity; because too much spirits will *do more harm than good,* and may actually hasten complete paralysis, and death. If spirits are not available, any good wine will be a good substitute.

8. Finally, Mr. Ditmars registers this sound concluding advice:

"If a doctor is out of the question, keep your head. You will need to think, and with great care. Give a cathartic. Keep the wounds absolutely clean, and remember that tissue that has been weakened by snake poison is particularly susceptible to common blood poisoning. Pack small bits of gauze (bandage material) into the wounds to keep them open and draining, then dress over them with gauze saturated with any good antiseptic solution. Keep the dressing saturated and the wounds open for at least a week, no matter how favorable the symptoms may be. There is every reason why a healthy man should recover, and quickly too, from a bite of any of the greater number of the venomous snakes in the United States; but the proper means to save life should be executed promptly and systematically."

Mr. Gruber's Treatment.—A practical method by which to escape death from the bite of a rattlesnake has been learned of Mr. Peter Gruber, of Rochester, New York, who has been bitten about twenty times. His method of treating himself was described to the writer as follows:

"I no longer suck the venom from a wound. Unless a man's mouth is in very perfect condition, it is dangerous. My first act is to take my knife, and cut a slit an inch and a half long straight from my body into the wound, and con-

tinue it the same distance beyond; and I make these two cuts bleed freely. This is to make the poisoned blood flow out of my veins, instead of farther into them, to poison my whole system. After the wound has bled as much as I think it should, I inject the permanganate above and around the wound. The proper proportion is one five-grain tablet of permanganate of potash dissolved in two ounces of water, and I inject about thirty minims—the capacity of a hypodermic syringe—about three times around and above the wound. I always have it ready, and I bathe the wound with this solution, using absorbent cotton to cover the wound so that it is not exposed to the air.

"During this time I take two or three small doses of whiskey,—but not much. After the permanganate has had a chance to take effect, I bathe the wound freely with a solution of two ounces of laudanum and two ounces of Goulard's extract in two quarts of water, and keep it moist with this until all unnatural colors leave it. And I drink quantities of milk—all I can swallow. After a time my stomach ejects it, and at first it comes up the color of snake venom. But I continue to take milk, again and again, until I am sure my stomach has been washed free from the poison. If the action of my heart grows weak, I inject strychnine into my arms with a hypodermic syringe."

Mr. Gruber bears on his forearms and hands a number of scars, as ocular proof of the success of his method in the treatment of rattlesnake bites.

BOOK IV.

AMPHIBIANS

CHAPTER XL

INTRODUCTION TO THE CLASS OF AMPHIBIANS

Among the many wonders of Nature, few are more interesting to the thoughtful mind than those forms which connect the great groups of vertebrate animals by bridging over what otherwise would seem like impassable chasms.

For example, between the classes of Mammals and Birds we have the Platypus, or Duck-Bill, an Australian mammal the size of a small musk-rat, which has webbed feet, and a duck-like bill, and which reproduces by laying eggs. Between the classes of Birds and Reptiles, there is a fossil bird called the *Ar-chae-op'-te-ryx*, with a long, vertebrated, lizard-like tail, covered with feathers. The *Hes-per-or'nis* was a water-bird with teeth, but no wings, which inhabited the shores of a great western lake which now is a vast stretch of arid bad-lands.

Between the Reptiles and the Fishes stretches a wonderful chain of living links by means of which those two Classes are united. So numerous are these forms, they make an independent Class, containing about 1,040 species. Originally this group was called *Ba-tra'chi-a*, but recently the fact has been recognized that that term is too limited in its application, and by the latest authorities the term *Am-phib'-i-a* has been adopted instead.

In the transition from the water-habiting Fishes, with gills and fins, to the land-going Reptiles, with lungs and legs, Nature has made some strange combinations. In some instances, fins, legs, lungs and gills have become so mixed that several notable misfits have resulted. In some cases we see legs going with gills, and in others fins and lungs are associated. Many of the Amphibians will serve teachers as very striking object lessons in the evolution of animal forms.

The **Class Amphibia** contains the cold-blooded vertebrates known as frogs, toads, salamanders, newts, proteans, and sirens.

In the insect-world, we are familiar with the three stages of existence by which the larva passes into the chrysalis stage, and later on emerges as a perfect insect. Here, among the vertebrates, we find creatures which also pass through two very distinct and sharply defined stages.

An **Amphibian,** if literally translated from the Greek, is a creature of "two lives." A typical amphibian begins life as a legless, fish-like creature, possessed of perfect gills, an eel-like tail, and living wholly in water. This is the *larval stage* of the animal. Later on, four legs make their appearance, the tail disappears by absorption into the body, the digestive organs change from simple to complex form, and lungs take the place of gills. In this *adult stage*, the creature (usually) is fitted for life on land if it so elects.

Owing to the bewildering variations of form and anatomy that are exhibited by various species, it is almost impossible to formulate a general statement regarding amphibians which will not be open to exceptions. If the reader will bear this in mind, we may venture to state the leading characters of the members of this Class.

General Characters.—All save a very few amphibians are hatched from soft, translucent, jelly-like eggs that are laid in shallow water, usually in stringy masses. Sometimes the larval stage of a species is passed in the egg, but usually this period forms an important part of the active life of the animal, and may be observed at length before the change to the adult stage takes place. Amphibians are (usually) covered with smooth skins, quite destitute of scales, and have minute teeth, or none at all. During the larval stage they feed chiefly upon vegetable food, but when adult the majority require animal food. Their skeletons are much more simple in structure than those of reptiles. The majority are aquatic. Some species permanently retain their gills, and live wholly in water; others, like the frogs and toads, lose their gills, acquire practical lungs and

legs, and live upon land at will. Of the 1,040 species of amphibians, only forty are without legs.

An *am-phib'i-ous* animal is not necessarily an amphibian. The hippopotamus, the seal, sea-lion, otter and crocodile are indeed very much at home in water, but they are far above the Class *Amphibia*. They are by no means creatures of two lives, and they do not pass through a larval stage before attaining perfect form.

Like the reptiles, the amphibians are confined to the torrid and temperate zones, but a surprising number of species permanently inhabit some very cold and inhospitable portions of the temperate zone. With but very few exceptions, the amphibians are quite useless to man. The legs of certain large species of frogs are prized by epicures, but with this exception, civilized man regards amphibians generally as inedible. Scientifically, the Class is highly interesting, chiefly by reason of the striking changes which so many of its members undergo. As a subject for the classroom and laboratory, frogs and toads are of well-nigh universal availability. Unfortunately, however, too many courses in elementary zoology do not forge beyond the frog.

As usual in seeking an acquaintance with Nature, a very simple diagram places this Class of animals on a clear and comprehensible basis.

A BIRD'S-EYE VIEW OF THE CLASS AMPHIBIA.

ORDERS.	FAMILIES.		TYPICAL SPECIES.	
ORDER ECAUDATA: The Tailless Amphibians; Frogs and Toads.	Water-Frogs,	*RA'NI-DAE*,	**Common Frog,**	*Rana clamata.*
			Bull-Frog,	*Rana catesbiana.*
			Wood-Frog,	*Rana sylvatica.*
	Tree-Frogs,	*HY'LI-DAE*,	**Tree-Frog,**	*Hyla versicolor.*
	Toads,	*BU-FON'I-DAE*,	**American Toad,**	*Bufo lentiginosus.*
	Burrowing Toads,	*PEL-O-BAT'I-DAE*,	**Spade-Foot Toad,**	*Scaphiopus holbrooki.*
ORDER URODELA: Tailed Amphibians.	Salamanders,	*SAL-A-MAN'DRI-DAE*,	**Axolotl,**	*Amblystoma mavortium.*
			Spotted Salamander,	*Amblystoma punctatum.*
			Newt,	*Triton viridescens.*
	Amphiumas,	*AM-PHI-U'MI-DAE*,	**Hellbender,**	*Cryptobranchus (Menopoma) alleghaniensis.*
			Congo "Snake,"	*Amphiuma means.*
	Mud-Puppies,	*PRO-TE'I-DAE*,	**Menobranchus or Mud-Puppy,**	*Necturus maculatus.*
	Sirens,	*SI-REN'I-DAE*,	**Mud-"Eel,"**	*Siren lacertina.*
ORDER APODA: Legless and worm-like Amphibians.	Caecilians,	*COE-CI-LI'I-DAE*,		*Typtilonectes compressicauda.*

CHAPTER XLI

THE ORDER OF FROGS AND TOADS

ECAUDATA

The members of this Order are the most numerous, most widely dispersed and the best known of the amphibians. In all there are about 900 species; and it may be added that the habits of some of them are very strange and interesting.

In their modes of life, the frogs and toads exhibit great diversity of inclination. The tree-frogs live in trees, the toads seldom leave dry land, the burrowing toads burrow in the earth, and the water-frogs live in water at least half the time.

Some of these creatures begin active life in water, as ugly, little fish-like tadpoles, and their transformation into the perfect frogs may easily be watched from beginning to end. In some of the toads, however, the tadpole stage is passed *in the egg*, and at hatching-time a fully developed but very minute toad emerges, and begins to hop about. Others again develop from the tadpole stage, much the same as frogs.

The larva of a species fairly typical of this Order as a whole may be found in the tadpole of any aquatic frog. It possesses a big, purse-like head,—like that of a goose-fish,—and a long, eel-like tail, surrounded by a continuous fin. At first there is no sign of legs. The intestinal canal is very long and simple, as befits the vegetable diet of the creature. In the transformation process, the tail is absorbed into the body, and long before it has disappeared, two pairs of legs have grown out. The front legs are weak, but the hind legs are long and powerful, and being attached at the extreme end of the body they have great freedom of movement. They are adapted both for leaping and swimming.

FROM TADPOLE TO FROG.

A series of specimens showing the development of the Common Frog. Prepared by RAYMOND L. DITMARS.

Of the adult creature, the body is short and broad, covered with a smooth skin, destitute of scales, and there is no tail whatever. The mouth is wide and capacious. The tongue is not free, being attached at the sides to the lower jaw.

The eyes are placed high up, quite above the upper surface of the head, so that the creature can float with only its eyes and nostrils above water.

The frog skeleton possesses several marked peculiarities, some of which must be noted, even though briefly. There are *no ribs*. The vertebrae are very few in number, but very wide in comparison with those of other vertebrates. The pelvis is of great size, and so long that it forms nearly one-half of the axis of the body. Instead of being attached at its sides, midway from top to bottom, the thigh bones (femora) are attached

LEOPARD-FROG.

Ra'na vi-res'cens.

at the extreme lower end,—the portion called the is'chi-um. In comparison with other vertebrates, the hind limbs and feet are of enormous proportions; and when these members are flexed, and then suddenly straightened out, the frog flies forward through the air as if thrown by a powerful steel spring. Some frogs can leap eight feet.

Although there are no ribs, there is a well-developed breast-bone, or sternum, for the attachment of the fore-legs; and it is said that in the frog the sternum appears for the first time in the development of the vertebrates from the lower forms.

The members of some groups of the frogs and toads have teeth in the upper jaw, on a bone called the *vomer;* others have teeth in both jaws, but the majority are toothless.

The hibernation habits of these creatures sometimes produce unexpected and remarkable results. Occasionally the public is startled by the publication of a story of a living frog or toad being dug out of solid rock, many feet below the surface of the earth. I have never had an opportunity to investigate any of these alleged occurrences, but a personal experience has at least furnished food for thought.

In a hot and dry jungle in the interior of Ceylon, I once made a search for elephant bones in the dry bed of what in wet weather was a shallow brook. The larger bones were found upon the surface, but so many of the smaller ones had become embedded in the sand that it was necessary to dig for them. The sand had become so hard and solid it was half-way toward sandstone, and our spades and mattocks loosened it with difficulty.

About eighteen inches below the surface, we came upon several small frogs, three species in all, closely and solidly entombed. Even the ignorant and stolid coolies were amazed and excited by the discovery. The sides of the animals were greatly distended by water, but from the first moment they were in full possession of their faculties.

As we released these creatures from their tombs and placed them upon the grass, each one disgorged a quantity of water, and hopped away. Evidently they had filled themselves with water and burrowed into the sand during the previous monsoon, then six months past, in order to live until the next rainy season; and had the annual water-supply of that little stream been permanently diverted, no one can say how many years these frogs would have continued to live in their solid tomb of sand. The natives said that excepting in their wells, there was no water anywhere for many miles around.

THE FAMILY OF WATER-FROGS.

Ranidae.

The Common Frog[1] is the most popular and well-known species in North America. It is the first to be heard in spring, it gathers in the

[1] *Ra'na cla-ma'ta.*

most numerous companies, and is one of the most cheerful and industrious croakers we know. Sometimes its cry becomes almost a warble; and when about fifty voices are raised in tuneful chorus from the surface of one small pond, each one trilling and piping at the rate of sixty to the minute, without missing a note, the effort is certain to attract attention, in case there is any to be bestowed.

This species is one of the handsomest of our water-frogs, and is colored to match its marshy home. Its upper ground-color is a brilliant-green, broken up by irregular black blotches that are bordered with dull white, with dark bars across the legs. The head-and-body length is about 2½ inches.

The Bull-Frog[1] is known by its deep-bass voice, and its great size when adult. Beside the preceding species, this creature is a giant, and it is small wonder that the eyes of epicures rest covetously upon its massive thighs. Its upper color varies from bright green to dark olive-brown, marked with small and rather inconspicuous dark spots. Its length varies from 5 to 8 inches, and it is so well known that further description is unnecessary.

As an indication of the extent to which frogs' legs are consumed as food in the United States, the latest statistics of the United States Fish Commission are interesting. In 1899, the total quantity of frog meat recorded in the markets was 472,415 pounds, valued at $74,690. The following were the chief sources of the supply:

	Pounds.	Worth.
Missouri	237,608	$29,313
Arkansas	79,760	10,162
California	20,687	20,638

In 1895, New York handled 69,774 pounds, valued at $6,572.

The Wood-Frog[2] is not often found without specially seeking it. In the spring, when you are searching for early flowers, and are startled by seeing a small dead leaf suddenly take life and leap about four feet, you may know that it is one of these small creatures. It is only 1½ inches long, being next in smallness to the tree-frog. Although for a frog so small it can leap a very long distance, its strength is soon exhausted, and its final capture is easily made.

[1] *Ra'na cates-bi-an'a.* [2] *Ra'na syl-vat'i-ca.*

THE TREE-FROG FAMILY.

Hylidae.

If tree-frogs were of great rarity, and inhabited only one remote island of a far-distant archipelago, their arboreal habits would be accounted as much of a wonder as the flying-frog of Borneo. But being fairly abundant in the eastern United States, the tree-frogs are regarded with but a mild degree of interest.

These creatures, which vary in length from one inch to five inches, have been provided with an opposable thumb, and a very effective sucking disc on the end of each toe, by which they are

NORTHERN TREE-FROG.

Natural size. Photographed at the instant of croaking, and copyright, 1903, by W. Lyman Underwood.

able to climb trees, and live very comfortably upon their branches. Of all vertebrates that live in trees, these tiny frogs are the most difficult to see. Even when one is chirping boldly and cheerfully within six feet of your eyes, it is necessary to look keenly in order to locate it. There are few kinds of rough bark with which the colors of a tree-frog do not combine with startling accuracy. The opposable thumb, which appears in frogs and tree-toads for the first time in Nature's ascending scale, is of great use, and in all probability it is the principal factor in the arboreal life of these animals.

In South America there are several species of tree-frogs whose females carry their eggs, during incubation, in pouches or cells *upon their backs.* It is believed that the eggs are placed in

position and embedded there by the male frogs. Other species attach their eggs to leaves that are afterward rolled together at the edges. Others deposit their eggs at the bases of large leaves where water collects, and some are credited with placing them where they will fall into pools, to be hatched there. A Brazilian species called the **"Smith"**[1] constructs, at the edge of a pool, a really wonderful circular wall or fortress, of mud, in which its eggs are deposited.

The Northern Tree-Frog[2] is our best and most common representative of this large Family. It is two inches in length, and in cloudy weather, especially when storms are gathering, its cheerful, bird-like call is universally regarded as a harbinger of rain. It is not a high climber, seldom ascending more than twenty feet from the ground. Its colors match tree-bark so closely it requires very sharp eyes to find it, and when seen it usually is believed to be a knot.

In croaking, its vocal sac swells to enormous proportions. Mr. W. Lyman Underwood has been successful in photographing this animal at the instant of utterance, and his very interesting picture is reproduced herewith.

THE TOAD FAMILY.

Bufonidae.

North American toads are distinguished from frogs by their rough, wart-covered backs, their dull colors, large and puffy bodies, smaller hind feet, shorter hind legs, lack of agility, and their land-going habits. The hopping amphibians which every summer shower brings out on sidewalks and country paths, usually are toads. Altogether, there are about eighty-five species, mostly tropical. The majority live upon land, a few burrow into the earth, and a few live in the water. There are many species so frog-like that it is difficult to note the characters (chiefly of internal anatomy) which distinguish them.

The Common Toad[3] may stand as the representative of the Toad Family of North America. The long-legged, lightly built frog leaps gracefully and far; but the plethoric Toad is content to wriggle or hop briefly through life. Its existence depends largely upon the fact that as yet man finds no value in it, and does not regard it as worth killing. When Toads become salable at five cents each, their extermination will follow soon.

The Toad deposits its eggs in water, in long strings, and after the transformation they grow so slowly that even in August the toadlets are so minute that about three could sit upon a copper cent. They seem more like insects than amphibians with bony skeletons. In winter, these creatures hide away in the deepest crevices they can find, or the cavities of hollow trees, or holes in the earth, and lie dormant until spring recalls them to life.

THE BURROWING TOADS.

Pelobatidae.

The Spade-Foot Toad[4] of the eastern and southern United States represents this large Family, of which two species only are found in the United States, and eighteen elsewhere. In the North, it is rarely seen, and little known. Personally I know nothing of it in life. Holbrook states that it is the commonest toad in the South; that it digs for its burrow a small hole about six inches deep, in which it lies in wait for every insect that may be tempted to enter. It seldom leaves its hole except in the evening, or after long-continued rains. This animal is two inches long, and its color is brown above, with dark patches.

THE TONGUELESS FROGS.

Excepting the members of two small Families, all frogs and toads have tongues. Of the Tongueless Frogs, one species — which is universally called a "Toad"—is of special interest in illustrating a very curious feature of frog life.

The Surinam Toad,[5] of Dutch Guiana, is celebrated among naturalists all over the world because of the remarkable manner in which its eggs are cared for and hatched. Just previous to the egg-laying period, the skin of the back of the female is specially prepared by Nature for a remarkable proceeding. It becomes very thick, spongy and soft. The eggs are taken by the male Toad, and one by one are *embedded in the skin on the back of the female*, so effectually that the skin closes over them, and each egg becomes partially

[1] *Hy'la fa'ber.* [2] *Hy'la ver'si-co-lor.*
[3] *Bu'fo len-tig-i-no'sus.*
[4] *Sca-phi-o'pus hol'brook-i.* [5] *Pi'pa americana.*

encysted, and retained in a cell of its own[1]. There they remain until they are fully incubated, the tadpole stage is passed, and a tiny, but perfect Toad emerges *from the skin of its mother's back!*

The number of young usually produced at one hatching is from sixty to seventy, and the period of incubation is from seventy-five to eighty-five days. At the close of this process, the thickened layer of skin on the back of the female loses its vitality, and is shed very much as a snake sheds a dead epidermis. Although the front feet of the Surinam Toad are small and webless, the hind feet are of great size, fully webbed, and so much drawn in at the ends of the toes that in swimming the foot is saucer-shaped.

There are other frogs which display remarkable intelligence in the production of their young, their methods going far beyond what one would expect in creatures as low in the vertebrate scale as the amphibians. As a whole, the members of this Order offer a wide field for the specialist.

[1] For a full description of the process, see the Proceedings of the Zoological Society of London, 1896, p. 595.

CHAPTER XLII

THE ORDER OF TAILED AMPHIBIANS

URODELA

The members of this Order are readily distinguished from the preceding group by the possession of tails, which they retain throughout their lives; by their gills, which most of them retain permanently; by the absence of scales, and by the fact that with very few exceptions they are strictly aquatic. It is safe to say that any four-legged aquatic creature having a tail but no scales, is either a salamander, newt, mud-puppy or siren.

The Order U-ro-de'-la is the dividing line between the finny, gill-breathing fishes, and the four-legged, lung-breathing, land-going lizards. Strange to say, its members are most abundant in the temperate regions of the earth, and except in two or three small areas, are absent from the tropics. In Australasia there are none, and in South America and Africa there are none save in their extreme northern portions.

Of all countries, the region embracing the United States and the southern provinces of Canada is by far the richest in species belonging to this Order, the total number present being fifty-two. Mexico and Central America contribute fourteen more, all salamanders. In this total of sixty-six species, eighteen genera are represented, fourteen of which are found only in the New World. The total number of species in the Old World is only thirty-six. In North America, the northern boundary of the Order Urodela is a line extending due east and west across the continent about on the 52d parallel of latitude. ("Amphibia and Reptiles," Dr. Hans Gadow, pp. 95–6.)

THE FAMILY OF SALAMANDERS.

Salamandridae.

The members of this Family seem to be engaged in a continuous struggle at the dividing line between lungs and gills, and exhibit all possible variations between perfection in both those organs. One species (the axolotl) changes from water to land with neatness and despatch. Another (the striped-backed salamander) lingers for two or three years in its larval state, in the water, while the blue-spotted salamander lives upon land, in moist forests. But one or two illustrations must suffice for all.

The Axolotl,[1] of Mexico, is in some respects the most striking — even theatrical — example of salamandrine life and character. Its transformation is so rapid and complete that it is highly impressive. As an Axolotl, it is either a dark gray or a perfectly white and almost translucent animal, about 7 inches long, with external gills divided into three long, ragged branches; a long tail with a continuous fin above and below, and four very practical legs. This is the larva.

If the pond in which this creature lives threatens to dry up, the gills and the fins on the tail and back begin to shrink, and disappear, and the animal begins to breathe air at the surface of the water. Finally, when the transformation is complete, a lizard-like animal with very serviceable lungs, no gills whatever, and not a vestige of fins on tail or back, emerges upon the land, and thereafter leads a terrestrial life. It is then known as a **Spotted Salamander;** and it is no wonder that for many years these two forms were considered creatures of different species. It was in the Jardin des Plantes, in Paris, that the process of birth, growth and transformation was finally discovered.

It is not difficult to bring about the transformation of the Axolotl, by gradually diminishing the water-supply, and thus observing from day to day the progress of the change. More than this, the transformation can be arrested by gradually diminishing the allowance of air, thus forcing the

[1] *Am-bly'sto-ma ma-vor'ti-um.*

THE TWO LIVES OF THE AXOLOTL.

The lower figure shows the wholly aquatic larval form, with gills and tail fins, called the Axolotl. The upper figure shows the same creature fitted for life on land, and known as the Spotted Salamander.

imperfect Spotted Salamander back into aquatic life. At first there is a struggle against life under water, but finally the animal becomes adjusted to it. (R. L. Ditmars.)

By keeping the larval Axolotl in an aquarium, with an abundance of water but with no encouragement nor facilities for breathing air, it not only remains in that stage indefinitely, but it breeds successfully.

This species is most abundant in the shallow lakes around the City of Mexico, but it inhabits nearly the whole of Mexico and also a considerable area in the southwestern United States. Unquestionably, the wonderful mobility—as it may truly be called—of this creature is for the purpose of enabling it to survive in a region wherein droughts are common, and where the life of an aquatic animal depends upon its ability to change from water to land. Of all members of the Order Urodela, this is to me the most wonderful.

Salamanders, Generally.—In shallow brooks, in still pools of all kinds, from the shaded woods of the East to the wind-swept, sun-bathed prairies and bad-lands of the West, and both on and in the damp earth of forests high and low, we occasionally find little smooth-skinned, lizard-like animals. They are slow in movement, weak and incapable of either defence or flight, and are at the mercy of almost any species larger than themselves. These are Salamanders, and in view of the fact that some are wholly aquatic and others wholly terrestrial, it is difficult to choose from our sixteen species one which may stand for the majority. The diversity of habit of these animals is greater than their differences in form. The various members of the group inhabit all sorts of quiet situations, from the rocks and dry ground of the *Blotched Salamander*[1] to the mountains of the *Blue-Spotted Salamander*,[2]

[1] *Am-bly'sto-ma o-pa'cum.*
[2] *Pleth'o-don glu-ti-no'sus.*

and the swift-running streams of the *Dusky Salamander*.[1]

Very frequently, salamanders are found underneath fallen trees, or stones, or under the bark of decaying logs; and on the western prairie farms the plough-share turns into the broad light of day many a burrowing amphibian.

On the whole, the **Spotted Salamander**[2] appears to be the best species with which to introduce the North American group. It is distinctly marked, and of wide distribution. Its length is 6½ inches, its body is broad and full, and its tail is shorter than its body. Above, its ground color is dark brown or black, on which is laid about thirty irregular yellow spots. The Spotted Salamander of Europe is a different species, its light markings being in the form of elongated patches or bands. Except for its external gills, the larva of this species looks much like an ordinary tadpole; but with transformation the gills disappear. Occasionally this species is found in spring-houses and cellars.

MENOPOMA, OR HELLBENDER.

THE NEWTS, OR TRITONS.

Pleurodelidae.

Although quite abundant in the Old World, (sixteen species), the newts are represented in America by only two species. All these tiny creatures inhabit water during the breeding season, but at its close, some species leave it, and live for a period upon land, where their habits are much like those of terrestrial salamanders.

Most species of newts look very much like small, weak, scaleless lizards, except that in some species the males, and in others both sexes, have broad fins on the tail, above and below. In some cases the upper fin is prolonged forward along the back, quite up to the head.

Of our two species of Newts, the **Crimson-Spotted Newt**[3] endeavors to make up by its abundance for the scarcity of species of the Genus *Triton* in America. It is quoted by herpetologists as "very common in ponds everywhere" in the State of New York, and its known range embraces the northern and eastern portions of the United States. It is about 3½ inches long. Its color above is brown, or greenish-brown, with two rows of bright vermilion spots, in all from 6 to 12. Its under surface is orange, marked with small black dots. Half-grown specimens are brownish-red, with the characteristic spots of bright red.

This puny little animal inhabits deeper water than most salamanders, and swims freely, often in an upright position, in which the hind legs hang motionless while the tail does all the work. It feeds upon the larva of aquatic insects, worms, and very small mollusks. For schoolroom aquaria, Newts are more easily obtained than any other of the tailed amphibians, and they are easily kept.

Our Newt has long been of much interest to American naturalists, and its complicated series of changes from the egg to adolescence have been carefully studied and reported upon.[4]

The Newt of western North America (*Triton torosus*) is one of the largest of the genus, and attains a length of 6 inches. The tail is longer than the body, much flattened vertically, and is provided with a dorsal and ventral fin. The under parts are colored yellow.

[1] *Des-mog-na'thus fus'ca.*
[2] *Am-blys'to-ma punc-ta'tum.*
[3] *Di-e-myc'ty-lus vir-i-des'cens.*
[4] See L. J. Gage in the *American Naturalist*, 1891, p. 1084.

THE FAMILY OF AMPHIUMAS.

Amphiumidae.

Unfortunately there is no English name which properly applies to the members of this Family. Some are like salamanders, and some are like eels; but none are "fish-like" salamanders, as they are sometimes called. In the perfect state they are without gills, the gill-clefts being in a vanishing stage, either reduced to a pair of small holes, or totally absent. Both jaws are provided with teeth, but the eyes are without lids.

This Family consists of two genera and three species, two of which are found in the United States, the other in Japan.

The Hellbender, or **Menopoma,**[1] is one of the ugliest looking creatures on this continent. When fully adult it is from 18 to 20 inches in length, its head and body are much flattened, while its tail is flattened vertically and completely finned. Its legs and feet are short and thick, and all along the middle of each side is a wide, convoluted fold of skin.

Its color is a uniform dull brown, accentuated by a few dark blotches of very irregular shape. On the left side there is a gill opening, but on the right there is none; and there are four pairs of gill-arches. The skin is smooth, but the head bears many wart-like tubercles.

This unpleasing animal is found in many of the streams that flow into the Ohio River, and the Mississippi also, but it is most abundant in Pennsylvania, especially in streams whose sources are in the Alleghanies. In its food habits it is very voracious, feeding upon worms, minnows and crayfish, and often taking the hooks of fishermen in quest of that most repulsive of all American fishes, the catfish. Fishermen hate the Hellbender; but between catfish and Hellbender there would seem to be small choice.

The Hellbender is very tenacious of life, and it is said that it can live on land for twenty-four hours without perishing. On this point, Mr. William Frear offers the following testimony:

"One specimen, about eighteen inches in length, which had lain on the ground exposed to a summer sun for forty-eight hours, was brought to the museum, and left lying a day longer before it was placed in alcohol. The day following, desiring to note a few points of structure, I removed it from the alcohol in which it had been completely submerged for at least twenty hours, and had no sooner placed it on the table than it began to open its big mouth, vigorously sway its tail to and fro, and give other undoubted signs of vitality."

Drawn by J. Carter Beard.

THE CONGO "SNAKE," OR EEL-LIKE SALAMANDER.

The Giant Salamander,[2] of Japan, is a brother species to the Hellbender, but is very much larger. It is the largest of all the amphibians, and sometimes attains a length of three feet. Specimens may always be seen in the Reptile House of the Zoological Park.

[1] *Cryp-to-bran'chus* (or *Men-o-po'ma*) *al-le-gha-ni-en'sis.*

[2] *Cryp-to-bran'chus max'i-mus.*

The Congo "Snake," or Eel-like Salamander,[1] is in many ways related to the foregoing species, but in external appearance it seems widely different. In appearance it looks like a blunt-nosed, wide-mouthed eel, with a tiny pair of legs close behind its head, and another pair about four-fifths of the way back to the end of its tail. Even in a small aquarium tank, in a well-lighted reptile house, these tiny legs are so thread-like and so short they are seldom noticed save by those who know they are present, and look specially for them. The absurd little feet on these ridiculous legs have but three toes, and the wonder is that such useless or "aberrant" appendages have not long since disappeared altogether.

The color of the Eel-like Salamander is a uniform gray-brown, and its length when adult is usually about two feet. There is a gill opening on each side of the neck, and there are four internal gill-arches. There are no external gills.

THE MENOBRANCHUS, OR MUD-PUPPY.

These creatures inhabit the muddy streams and stagnant waters of our southeastern states, and are in the habit of burying themselves in the mud, sometimes to a surprising depth. They feed upon every form of aquatic animal life which is small enough to be seized and swallowed—insects, worms, crustaceans, shell-fish and even small fishes. In the South they are occasionally found in the ditches which irrigate the rice-fields.

[1] *Am-phi-u'ma means.*

FREE-GILLED SALAMANDERS.

Proteidae.

This very small Family contains only three genera, with but one species in each. One of these, the **Olm**[2] of Europe, is recognizable at sight by its general eel-like appearance, its tiny legs far apart (like the Congo "Snake"), and the big bunch of external gill-branches waving on each side of the neck, close to the head. This animal is totally blind, and is found only in the caverns of the Alps.

The Mud-Puppy, or Menobranchus[3], bears a strong external resemblance to the Hellbender, but is readily distinguished from the latter by the conspicuous mass of external gill-branches with which the animal fans the water at every breath. It inhabits many of the rivers of Ohio, Pennsylvania, Indiana, the Great Lakes and northern New York, and is often taken in fishermen's nets.

The Subterranean Protean of Texas.—Very recently a rather startling discovery was made in Texas, near San Marcos. From the bottom of an artesian well 188 feet deep, there came up with the water several blind Proteans, colorless and white, which up to that time had lived only in the subterranean streams and pools of the earth's crust, and were quite unknown. Along with them came four new species of Crustacea (crab-like creatures); and doubtless it was upon those that the Proteans lived. Unfortunately, thus far those who received the new amphibians did not succeed in inducing them to eat, and none have survived. The species has been christened *Typh-lo-mol'ge rath'bun-i.*

THE TWO-LEGGED SALAMANDERS.

Sirenidae.

Near the foot of the Class *Amphibia*, we find the **Two-Legged Salamanders,** of which there are only two species, both American. Both look

[2] *Pro'te-us an-guin'e-us.*
[3] *Nec-tu'rus mac-u-la'tus.*

very much like the Congo "Snake"; but the hind legs are totally absent, and external gills are conspicuously present. The front legs, which are close behind the gills, are larger than in any other of the eel-like salamanders, and are of some slight use.

The Siren Salamander, or **Mud-"Eel,"**[1] of our southeastern states, has four toes on its feet, three pairs of gill openings, a smooth skin of a dull black color, and when fully adult a length of about 24 inches. The habitat and habits of this creature correspond closely to those of the Congo "Snake" of the southern rice-fields and swamps.

THE ORDER OF WORM-LIKE AMPHIBIANS.

Apoda.

Last and lowest in the Class *Amphibia*, we find a group of creatures that externally seem more like worms than vertebrates. It is interesting to know that there are true vertebrates so very worm-like that they have neither legs, feet, nor fins. Some, however, have overlapping scales, like fishes.

Collectively, these animals are called **Caecilians** (pronounced se-sil'i-ans). There are forty species, inhabiting the lower half of Mexico, Central and South America, equatorial Africa, India, Burma and northern Australasia, but not the United States. They are of burrowing habits, and their skulls exhibit a degree of solidity and strength quite in keeping with the necessities of creatures which can burrow only with their

SIREN SALAMANDER, OR MUD-"EEL."

heads. Many of them are totally blind—by the concealment of their eyes under the skin, or the maxillary bones. (Gadow.) The exact relationships of the Apoda are yet to be determined conclusively.

[1] *Si'ren la-cer-ti'na.*

BOOK V

FISHES

Drawn by J. Carter Beard.

REMARKABLE MEMBERS OF THE ORDER OF SOLID-JAW FISHES. (*Page* 410.)

1. TRIGGER-FISH (*Balistes capriscus*).
2. BOX-FISH (*Ostracion tricornis*).
3. PORCUPINE FISH (*Chilomycterus geometricus*), inflated
4. PUFFER (*Tetrodon turgidus*). with air-sac inflated.

CHAPTER XLIII

INTRODUCTION TO THE CLASS OF FISHES

The study of fishes is called *ich-thy-ol'o-gy.*

So great is the number of species that the mass is, at first thought, fairly bewildering. During the last twenty years the researches of the men who devote their lives to the study of fishes (called ich-thy-ol'o-gists) have brought to light hundreds of new forms.

The inhabitants of the waters of North America, alone, form a great multitude. Of the fishes found north of Panama, marine and inland, the "Descriptive Catalogue" of Drs. Jordan and Evermann, Part IV, completed in 1900, enumerates the following groups, species and subspecies as recognized by those authors:

Orders of Fishes	30
Families	225
Genera	1113
Species	3263

The four volumes comprising the work mentioned above make a pile nine-and-a-half inches high, and contain 3,313 fine-print pages of text, and 392 plates. The "Systematic Arrangement," or table of contents, is wholly in Latin, and fills 95 closely-printed pages. The work has been carefully devised to be of no use whatever to anyone save an ichthyologist.

When this array confronts the general student, the prospect is rather appalling. From the first page to the last, every technical work on fishes abounds in descriptive terms that to most persons are about as attractive as the spines on a porcupine fish. If the general reader attempts to master them, he soon finds himself involved and discouraged, and the desired general view of our finny tribes is obscured in fog.

But the whole subject of fish study is merely a matter of method. With fishes, as with the other vertebrates, the *Orders* are the master keys by which a proper exhibit can be unlocked and displayed. At the same time, the Subclass divisions are of great importance, and must constantly be kept in mind. Leaving out the deep-sea fishes, which we can well spare for the present, there are twenty well-defined Orders, the types of which are almost as easily known and remembered as a score of pictures in an art gallery. *The Orders must not be lost sight of,* for when they are firmly grasped by the understanding and the memory, the fog begins to rise.

General Characters.—A typical fish is a cold-blooded animal, with a bony skeleton, an elongated body which is covered with overlapping scales, and an outfit of fins for balancing, steering and propulsion. It has gills instead of lungs, fixed eyes, and a swimming-bladder, and is specially fitted for a wholly aquatic life. It is provided with teeth, it hears sounds by the transmitting power of the bony plates of the skull, and usually it lays eggs for the production of its young. The body of a typical fish is wedge-shaped, narrowest at the tail, thin from side to side, and the head tapers to a blunt point. This form is specially designed for rapid and easy progress through water.

The Black Bass may fairly be regarded as a perfectly typical fish.

The variations from the perfect type are almost innumerable. For example:

The Lung-Fish has foot-like fins, and practical lungs.

The Catfish has no scales.

Some Sharks and a few other fishes bring forth their young alive.

The Rays and Skates are the flattest of all vertebrates.

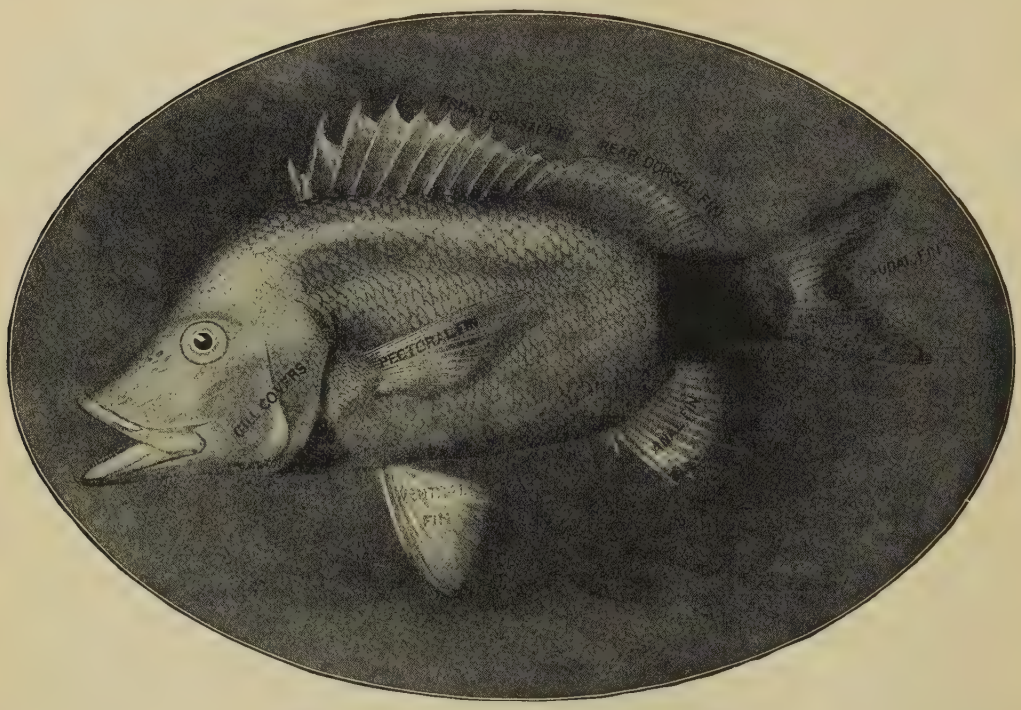
The Climbing Perch can climb.

The Flying-Fish can rise from the sea, and fly.

The Lantern Fish, of the deep sea, carries a phosphorescent light upon its head.

The anatomy of fishes is a special branch of knowledge in which the general reader can scarcely be concerned, but for the young ichthyologist there are many special works. Books for the identification of all the known species of fishes in North America are now available for those who desire them. At present, however, we are concerned only with the twenty great groups, or Orders, and the fifty or sixty important types which represent them. Of these there must be some serious study.

Up to this date, nearly every systematic writer



THE NAMES OF THE FINS OF A TYPICAL FISH.

The species shown is the Black Grunt (*Haemulon plumieri*), and it represents the large and commercially important Family of Grunts (*Haemulidae*), represented in our warm waters by about 55 species.

upon the Fishes as a Class has chosen either to alter or ignore previous classifications, and adopt the arrangement which to him has seemed most logical and reasonable. In order to conform to this time-honored custom, I have elected to do likewise!

With the subdivisions of the Orders, we are not at present seriously concerned, our main object being to block out the larger groups, only. The arrangement of Orders set forth on pages 378–9 is called a "practical arrangement" because it can be understood, and is available for practical, every-day use.

THE STRUGGLE TO SAVE THE NATION'S FISH SUPPLY.

The decrease of the per capita supply of beef, mutton, and pork, and the permanently fixed high prices for meats of all kinds, have spurred both the federal government and the states to their utmost activities in the production and distribution of fish eggs and young fishes. The effort to keep ahead of the fisherman and consumer of fish has come down to a struggle to keep even with the fish consumer, and prevent as much of extermination as can be prevented. In some states the maintenance of a good supply of killable game seems to have been well-nigh abandoned, and in its place the major effort is being made to prevent the pollution of streams, and keep up the supply of fish for food and for sport.

The following is from a special report of the U. S. Bureau of Fisheries (No. 1,011) for 1926:

"Probably the most popular and educational feature of the fish-cultural work of the Bureau of Fisheries during the past fiscal year was the development and extension of the fish-nursery project that was inaugurated during the last half of the previous fiscal year.

"The output of fingerling fish in 1926 was almost twice that of the preceding year, due to the special efforts made to rear fish at every point where suitable facilities for such work exist. The public demand for fingerling fish is increasing rapidly, and it is doubtful whether there is any

way of meeting it except by arranging with various fish and game organizations throughout the country to rear a large proportion of the small fish incubated each year at the Federal hatcheries.

"With the view of meeting the *greatest need of the bureau, which is for more bass, crappie, and other warm-water pond fishes, the propagation of such species on a large scale at a number of pond locations in various sections of the United States* is being considered. If such plans can be carried out, ponds varying in size from fifty to one hundred acres will be utilized for the production of fingerling fish, which will be distributed in the fall when three or four months old."

During the past five years, one principle of fish culture has undergone an important change. In the U. S. Bureau of Fisheries and in some states, the distribution of very young and tiny fish "fry" is giving place to the production of fish that have been kept in the hatchery, and suitably fed, for from one to two years. Says Mr. W. E. Parsons, Maine Fish and Game Commissioner: "We find these fingerlings, yearlings and two-year-olds much more successful in the stocking of waters than the planting of fry. We are running twelve hatcheries and several rearing pools in addition to raising fed fish."

The fish-raising activities of the federal government, by the United States Bureau of Fisheries, has grown to vast proportions. In 1926 there were seventy hatcheries in thirty-three states and Alaska. The following exhibit of the total output affords a valuable array of detailed information regarding the possibilities with forty of our most important species of food and game fishes:

Work of the United States Bureau of Fisheries.

Total output and distribution of fish and fish eggs during the year ending June 30, 1926:

Catfish	32,364,500
Buffalo Fish	116,573,600
Carp	94,849,500
Sand Perch	5,000
Shad	9,143,800
Glut Herring	55,000,000
Whitefish	208,344,000
Cisco	95,080,000
Chinook Salmon	62,921,900
Chum Salmon	18,163,500
Silver Salmon	9,901,700
Sockeye Salmon	74,626,800
Humpback Salmon	1,843,500
Steelhead Salmon	6,487,800
Atlantic Salmon	1,001,600
Landlocked Salmon	1,086,600
Rainbow Trout	7,989,400
Black-spotted Trout	14,259,400
Loch Leven Trout	7,497,500
Lake Trout	31,816,400
Brook Trout	14,762,100
Silver Trout	232,700
Grayling	4,823,800
Pike and Pickerel	465,800
Pike Perch	213,732,200
Mackerel	2,067,000
Crappie	26,741,600
Large-mouth Black Bass	2,313,800
Small-mouth Black Bass	971,700
Rock Bass	66,100
Warmouth Bass	4,900
Sunfish	27,746,700
Yellow Perch	132,705,400
White Bass	42,500
Sheepshead	300
Fresh-water Drum	130,300
Cod	983,967,000
Haddock	145,946,000
Pollock	428,788,000
Winter Flounder	2,388,057,000
Miscellaneous Fishes	9,851,600
Total	5,232,373,000

Of the above grand total of 5,232,373,000 units, fish eggs distributed represented 737,136,100; fish fry, 4,195,942,200, and fingerlings, 297,294,700. For the year that ended in 1902, the grand total was 1,414,523,374 which reveals a nearly four-fold increase for 1926.

A PRACTICAL ARRANGEMENT OF

BASED CHIEFLY UPON VISIBLE CHARACTERS; DEEP-SEA

SUBCLASSES	ORDERS AND CHARACTERS	TYPES AND EXAMPLES	PAGE
LUNG FISHES: Nearest to the *Amphibia.*	**LUNG-FISHES,** . . . *SI-REN-OI'DE-I* . . Fishes with partial lungs, rudimentary legs, and molar teeth.	**Australian Lung-Fish**	380
		South American Mudfish	381
BONY FISHES: Typical Fishes, high and low forms.	**SPINY-FINNED FISHES,** . . . . . *AC-AN-THOP'TE-RI* Typical fishes, with perfect gills, fins, scales, and bony fin-rays.	**Bass**	382
		Sunfish	384
		Perch	386
		Bluefish	387
		Mackerel	388
		Tuna	489
		Mullet	390
		Red Snapper	391
		Dolphin	392
		Swordfish	392
		Remora	393
	PIKES, ... *HA-PLO'MI* . . . . Head flattened and scaly. Only one dorsal fin, far back.	**Pike**	394
		Muskallunge	394
		Pickerel	395
	TROUT and SALMON, *I-SO-SPON'DY-LI* . Differential characters relate wholly to bony anatomy.	**Trout**	396
		Salmon	398
		Tarpon	406
		Shad	407
		Whitefish	408
		Herring	
		Menhaden	
	FLYING FISHES, . . *SYN-EN-TOG'NA-THI* Pectoral fins greatly enlarged ; some species able to fly.	**Flying Fish**	409
	SOLID-JAW FISHES, *PLEC-TOG'NA-THI* . With solidified teeth and strong jaws. Mostly with rough, file-like skins.	**Trigger-Fish**	410
		Box-Fish	410
		Puffer	410
		Porcupine Fish	411
	SUCKERS and MINNOWS, ... *PLEC-TO-SPON'DY-LI* Differential characters based wholly upon bony anatomy.	**Common Sucker**	412
		Buffalo Fish	413
		Carp	413
		Minnows	414
	HALF-GILLED FISHES, ... *HEM-I-BRAN'CHII* . With imperfect or incomplete gills.	**Stickleback**	415
	CATFISHES, ... *NEM-A-TOG'NA-THI* Scaleless ; head broad and flattened ; barbels around mouth ; defensive spines in dorsal and pectoral fins.	**Mississippi Catfish**	416
		Bullhead	417

THE ORDERS OF LIVING FISHES

ORDERS OMITTED. TYPES CHIEFLY NORTH AMERICAN

SUBCLASSES	ORDERS AND CHARACTERS	TYPES AND EXAMPLES	PAGE
BONY FISHES: *Continued.*	**FLAT-FISHES,** . *HET-E-RO-SO'MA-TA* Without bilateral symmetry. Both eyes on one side. Flat, oval. Swim in horizontal plane.	**Common Halibut**	418
	FOOT-FISHES, . *PE-DIC-U-LA'TI* . Mouth enormous ; body broad, flattened, bag-like. Pectoral fins long at base.	**Angler**	420
	EELS, ... *AP'O-DES* . . . . Body long, slender, snake-like. No ventral fins, no scales.	**Electric Eel** . .	421
	PIPE-FISHES and SEA-HORSES, *LO-PHO-BRAN'CHI* Gills tufted ; mouth tubular ; body covered with scale armor. Very unlike true fishes.	**Pipe-Fish and Sea-Horse** . .	423
GANOIDS: Armored Fishes, and their allies.	**The DOGFISH,** . *HAL-E-CO-MOR'PHI* Air bladder cellular, acting as rudimentary lung. Helmet-headed.	**Dogfish or Bowfin**	424
	GAR-FISHES, . . *GING-LY-MO'DI* . Ancient forms, covered with formidable bony armor.	**Gar Pike** . . . **Alligator Gar** .	425 425
	STURGEONS, . . *GLAN-I-OS'TO-MI* . Body with rows of large, bony plates. Mouth with barbels.	**Lake Sturgeon** .	427
	PADDLE-FISH, . *SEL-A-CHOS'TO-MI* Scaleless, shark-like. Broad, bony paddle projecting from nose.	**Paddle-Fish** . .	429
CHIMERAS:	**CHIMERAS,** . . . *CHI-MAE-ROI'DE-I* Odd, shark-like forms.	**Chimera collei** .	431
CARTILAGINOUS FISHES: With soft skeletons. Lowest Fishes.	**SHARKS,** . . . . . *SQUA'LI* . . . . Scales minute ; skeleton cartilaginous. Many species bring forth their young alive.	**Mackerel Shark** **Hammerhead** .	432 433
	RAYS and SKATES, *RA'I-AE* . . . . Excessively flattened, but otherwise shark-like. Many species with long, whip-like tails.	**Shark-Ray** . . **Sting Ray** . . . **Devil-Fish** . .	434 435 435

CHAPTER XLIV

ORDER OF THE CONNECTING-LINK FISHES, WITH LUNGS AND LEGS

SIRENOIDEI

As in the preceding sections of this work, we will begin our studies of the Class of Fishes with the highest forms, and run down in regular course to the lowest. Of the 144 Families composing this class, as it occurs in North America, it is impossible to mention separately more than a very few of those which are of greatest importance.

THE AUSTRALIAN LUNG-FISH.

The Lung-Fishes are introduced because they are the highest of all the fishes, and form the connecting link between that class and the amphibians. Of the three genera that are known, one is found in Australia, two in Africa, one in South America, and in North America, none.

To some ichthyologists, the great **Australian Lung-Fish**[1] is the most interesting of all fishes. It is not only an intermediate form between the amphibians and fishes of to-day, but it is a creature that has far outlived its natural fate. Its magnificent living *Ceratodus* four feet long, with an ancestry running back half a million years without a break, it makes one's brain whirl to reel in the idea. This creature's ancestors lived in the days when many fishes were struggling to develop legs and lungs, with which to go on land, and become salamanders first, then lizards. It is said that this fish sometimes leaves the water and goes about on adjacent mud-flats, like the jumping fish of the Malay Peninsula; but the statement needs confirmation.

The Australian Lung-Fish is from 4 to 5 feet long, and it is said that its maximum weight is about 20 pounds. It breathes air over its palate

[1] *Ce-rat'o-dus fors'ter-i.*

like a reptile, and its swimming-bladder is so developed that it does duty as low-class lungs. Its gills are very small and imperfect, and of little use. The top of its skull is quite unlike those of other fishes, and its scales are very large. Its pectoral and ventral fins are very long and leg-like, and are covered with scales everywhere save on the edges, where the fin-rays are situated.

One of the most extraordinary features of this strange fish is the possession of large and very remarkable molar teeth, those above being set in the palate (vomer), and evidently designed for the cutting up of vegetable food. Leaving bony anatomy out of consideration, it is quite clear that the living fish which stands nearest to *Ceratodus* is the jumping fish or mud-skipper, of the Malay Peninsula, which hops about on land with surprising independence and agility. Its long pectoral fins are really foot-like in usefulness.

Both in the Burnett and Mary Rivers of Queensland, where it lives, and also in captivity, this Lung-Fish frequently rises to the surface of the water to take breath, like a porpoise.

The allied *Mud-Fish* (*Lepidosi'ren*) of the Amazon, and the *African Mud-Fish* (*Protop'terus*) of the River Gambia, have legs that are mere wisps of skin and flesh, and strongly resemble our *Amphiuma*, of the Class *Amphibia*. They are rarely seen alive in captivity.

CHAPTER XLV

ORDER OF THE SPINY-FINNED FISHES

ACANTHOPTERI

Even of forms classed as North American, this gigantic and rather unwieldy Order contains 45 Families and 483 species. Fortunately the groups which are of general interest are sufficiently limited in number that it is possible to place representatives of them before the reader.

THE BASSES AND SUNFISHES.

Cen-trar'chi-dae.

The Bass and Sunfish Family enjoys, on the whole, the widest popularity of all the finny Families of North America. With due respect to the justly distinguished Trout Family, I believe its members are known personally to a much smaller number of people than those of the Bass Family. The reason is that the latter are abundant in the most densely populated portions of the United States, while the human neighbors of the trout are comparatively few.

This Family (of thirty species) leads from the narrow-bodied and athletic black bass, by regular gradations in breadth through the rock bass, calico bass and their allies down to the little gem-like sunfish, with the extreme width of body and the limit of smallness and timidity. The black bass fights like a wild-cat, the sunfish can be taken on a bent pin, at the end of a cotton string; but observe this proportion:

The Sunfish is to the Small Boy as the Black Bass is to the Man.

It is good to find in Nature a Family whose members run from top to bottom in a stair-like series; for if so studied, the natural sequence is a great aid to the memory. We therefore begin with the narrowest fish, and descend to the broadest.

Surely, the **Black Bass,** be his mouth large or small, is a fish fit to head a Family. You can catch an eight-pound yellow pike-perch, and think you have hooked a bunch of weeds; but if you hook a two-pound Black Bass you know at once that you have engaged a Fish.

For its size, this is the bravest and the gamiest fish that swims in our waters. In size and in silver the tarpon is truly the silver king of game fishes; but if he had Black-Bass energy and courage in proportion to his size, no hook-and-line angler in a small boat would bring him alive up to the end of a twelve-ounce rod.

The Black Bass has the narrowest body and the darkest color found in the Bass Family. It is built for speed and strength, and colored for concealment. There are two species, so very much alike that there is practically but one point of difference—the size of the mouth; and naturally their habits are quite identical. It is important to remember, however, that in color and markings, individuals vary most strangely and unaccountably. Some are uniform dark and light; others are mottled, much and little.

The Small-Mouthed Black Bass[1] is the fish of the East and North, from western New Hampshire to Manitoba, and southward to South Carolina and the northern Gulf states to Arkansas.

It is a pity that so fine a fish should not be handsomely colored, but it is really very plain and unattractive. Its back is usually a uniform dull olive-green, the sides being somewhat lighter. A Bass of three pounds weight may fairly be counted a large one, but this species has been known to attain a length of 18¾ inches, and a weight of 5 pounds.

This is strictly a clear-water fish, and for this reason its capture is a source of pleasure beyond anything that can be drawn from muddy waters. It takes live minnows, or worms, or a neat trolling spoon, but resists the hook and the dip-net to the last extremity. Its flesh is excellent, and its propagation a matter of both state and national

[1] *Mi-crop'ter-us dol'o-mieu.*

importance. It has been planted successfully in so many bodies of water outside its original range that the limits of the latter are likely to be lost to view.

The Small-Mouthed Black Bass has the corner of its mouth directly under the front angle of the eye, while the mouth of the **Large-Mouthed**[1] species terminates under the rear corner of the eye. The range of the latter is from Manitoba, southward to the Gulf states, and spreads through the latter to Texas and Florida. In twelve months of 1925 the catch of Black Bass for market amounted to 908,896 pounds, valued at $130,174.

The Rock Bass, or **Red-Eye,**[2] stands next in width of body to the black bass, and intermediate between it and the next species. Sometimes the resemblance between the Rock and calico bass is so close as to be at first sight a little confusing. But spread the dorsal fin to its full extent, and it will tell the story. In the Rock Bass it is long, rather low, and its front half contains eleven stout spines, of nearly equal length. The calico bass has a short and high dorsal fin, with only seven large spines; and the body of the fish is of greater depth.

The Rock Bass is a fish of the Great Lakes region and Mississippi valley—a clear-water fish, of habits quite similar to the black bass. Every way considered, it is a very perfect connecting link between the black bass and the next species. Its weight seldom exceeds 1½ pounds.

The Warmouth Bass[3] is a fish of the South, and in form is an intermediate between the rock bass and calico bass.

The Calico Bass, or **Strawberry Bass,**[4] is a

Drawn by J. Carter Beard.

1. SMALL-MOUTHED BLACK BASS.
2. CALICO BASS.
3. COMMON SUNFISH.
4. YELLOW PERCH.

[1] *M. sal-moi'des.* [2] *Am-blop'li-tes ru-pes'tris.* [3] *Chae-no-bryt'tus gu-lo'sus.* [4] *Po-mox'is spa-roi'des*

handsome and substantial fish. Its bright, silvery coat is beautifully mottled with olive-green blotches, so regularly splashed on as to suggest the pattern of a piece of calico.

Take, if you please, a beautiful bay on the southern shore of Lake Ontario, a sunny day in May, no hotels or cottages in sight, with red-winged blackbirds singing *"O-ka-lee'"* in the cat-tails, and the Calico Bass becomes one of the prettiest fish you can pull out of the water. Each time, it gives a firm and vigorous bite, and leaves the water with a *swish* that once heard under proper conditions lives long in the memory.

I like the Calico Bass because it is so handsome, so well set-up, so substantial on the string, and so delicious on the table. A large specimen measures only about ten inches in length, but by reason of its great depth of body, and its thickness, too, it is a fish well worth having. Its weight never exceeds two pounds, and usually is about one pound. Besides the names given above, it is called the Grass Bass, Bar-Fish and "Crappie"; but the latter name belongs to another species.

The Calico Bass is at home throughout the whole region of the Great Lakes, the valley of the Mississippi to Louisiana and Texas, and along the Atlantic side down to the Carolinas and Georgia. In the beautiful lakes and ponds of Michigan, Wisconsin and Minnesota it is abundant, and highly valued. It can be taken still-fishing with worms, minnows, and grasshoppers, and also with a small trolling spoon.

It dislikes warm and muddy waters, it is a clean feeder, not quarrelsome or destructive to weaker species, and is said to increase rapidly. Strange to say, the propagation of this fine fish has received scanty attention from American fish-culturists, and in 1900 only 7,544 were distributed by the United States Bureau of Fisheries. It seems to me that for stocking northern lakes and ponds this is one of the most desirable of all the smaller fishes; and I wish long life and prosperity to the Calico Bass!

The Crappie[1] is a muddy-water understudy of the preceding species. In some portions of the North, the two species overlap each other, but in the main the Crappie is a southern fish. In 1900, the number distributed by the United States Bureau of Fisheries was 151,653.

[1] *Po-mox'is an-nu-lar'is.*

The Sunfishes are divided into fifteen species, and as a group their range covers the whole of the United States eastward of the Great Plains. Poor indeed in fish life is the pond or stream between Maine and Texas, Dakota and Florida which contains no sunfish, bream or bluegills, pumpkin-seed or dollaree. In about nine cases out of ten, the first fish that dangles from the first hook-and-line of the very small American angler is a sunfish. Small though it be, and feeble, it is yet *a Fish;* and it is large enough to open to Childhood the door to a great wonder-world of fish and fishing. Where is the veteran fresh-water angler who does not recall the electric thrills of his first "bite," and his first living, wriggling, scintillating Sunfish! Blessings be upon their rainbow-tinted sides for the joys they have been, are, and yet will be to Childhood!

Out of so many species it is difficult to select representatives, but it seems that first choice should fall upon the following:

The Common Sunfish, or **Pumpkin-Seed.**[2] —This is the brilliant olive-green, blue and orange-yellow fish which when taken dripping from the water has all the colors of a green opal, and several more. It is distinguishable by the touch of bright scarlet on the lower portion of its gill-covers. It is found in clear ponds, large brooks and other streams from Florida, northward and eastward of the Appalachian chain to Maine, thence westward through the Great Lakes region to Iowa and Manitoba. It is subject to considerable variations in color markings.

In the Great Lakes, this fish attains a weight of 1½ pounds, but elsewhere a specimen 6 inches in length and weighing 8 ounces is considered a large one.

The Blue-Gill or **Black-Gill**[3] is the largest of the sunfishes. Its opercle, or gill-cover, terminates on the side in an ear-like flap which is of a deep black color; and this conspicuous character at once proclaims the species. This fish is found throughout the Great Lakes region and Mississippi valley. It sometimes attains a length of 12 inches, and a weight of 1½ to 2 pounds, and in some localities it is an important market fish.

[2] *Eu-po-to'mis gib-bo'sus.*
[3] *Le-po'mis pal'li-dus.*

THE SEA-BASS FAMILY.

Ser-ran'i-dae.

In the ocean and its dependencies there exists a Family which, in general form, and anatomy also, so closely resembles the fresh-water Bass Family that it is almost impossible to base distinctive characters upon skeletal differences. The Sea-Bass Family, of North American waters, contains 104 species, some of which are of colossal size. Whenever you go a-fishing in tropical or subtropical waters, and catch a large, thick-bodied, big-scaled fish that you cannot name, it is generally a safe hazard to call it a Sea-Bass.

The great **Jewfish,** or **Black Sea-Bass,**[1] of Santa Catalina anglers, is one of the largest of the spiny-finned fishes. During the last ten years it has become celebrated because it permits itself to be outwitted so easily by the amateur angler. A very large fish can be caught with rod and line that seem absurdly light for such work.

With heavy tackle, the catching of a large Jewfish would be no more of an event than would the pulling in of a Greenland halibut; but to go with one companion miles out from shore in a boat weighing from 125 to 150 pounds, catch a 300-pound fish on a sixteen-ounce rod, and kill it, without even getting upset, is a feat worth while. If a large Sea-Bass possessed the courage and fighting qualities, pound for pound, of the fresh-water black bass, it would take a hawser and a donkey engine to handle the line, a tug-boat to withstand the shock, and a bomb-lance to kill the fish when alongside.

In the Tuna Club of Santa Catalina (southern California), the holders of the highest records for the capture of Sea-Bass up to 1927 were as follows: N. A. Howard, Pasadena, 1916, 493 pounds; I. G. Murphy, Converse, Ind., 1905, 436; I. S. Dempsey, Madisonville, Ky., 1911, 430½; and E. T. Wallace, Los Angeles, 1912, 427.

On our Atlantic coast, from Charleston to Brazil, occurs another huge fish to which the popular name **"Jewfish"** is applied. It is really the **Black Grouper.**[2] Its normal weight is 500 pounds, and "only one specimen weighing less than 100 pounds" has been recorded. (Jordan and Evermann.) I have reason to know the appearance of this fish quite well. It is a great, hulking, coarse-grained creature, unattractive to the eye, except that of the successful light-tackle angler, and very inferior on the table. In no point has it the look of a high-class animal, for every line is coarse and plebeian; but it has the avoirdupois of a Wonder.

BLACK SEA-BASS.

Mr. N. A. Howard's highest record, 493-pound Giant Bass, taken with rod and reel at Santa Catalina Island, Calif., in 1916.

About 1925 one year's catch of Sea-Bass yielded 2,458,086 pounds, worth $177,586.

It appears that our Bureau of Fisheries does not find it practicable to propagate the big Sea-Basses, due no doubt to the difficulty in collecting eggs. Several other marine fishes are being successfully exploited in seacoast hatcheries. Important species successfully handled are cod, haddock, pollock, mackerel and winter flounder.

The Striped Bass,[3] **Rock-Fish,** or **Rock,** is the finest representative of the whole great Family of Sea-Basses. It is a fish of handsome

[1] *Ster-e-o-le'pis gi'gas.* It should be remembered that in another genus of this Family, called *Centro-pris'tes,* there is another species, found along our Atlantic coast, that is also called the Black Sea-Bass.

[2] *Gar-ru'pa ni-gri'ta.*

[3] *Roc'cus lin-e-a'tus.*

form and colors, its table qualities are excellent, and it is a persistent breeder. Its ground color is silver-white, on which is laid, along the upper two-thirds of the body, a series of seven

STRIPED BASS, OR ROCK-FISH.

straight, equidistant stripes of black. It is a fish of large size, often attaining a weight of 85 to 90 pounds, and its flesh is most excellent. In the markets it stands next in desirability to the shad and bluefish. The greatest weight recorded for this species (by Dr. G. Brown Goode) is 112 pounds.

The centre of abundance of this fine fish is now from Fire Island, New York, to Albemarle Sound, on the coast of North Carolina. Many great catches have been reported, the most notable of which were the following: At Bridgehampton, N. Y., in 1874, 8,000 in less than a week; by Charles Ludlow, 1,672 bass at one set of a seine; at Norfolk, Va., 1,500 at one haul; in eight days of June, 1879, off Fire Island, one fisherman caught 10,164 pounds.

The full range of the Striped Bass is from the St. Lawrence River to New Orleans, both along the coast and in all the great rivers which flow into that region. At Cuttyhunk Island, and in scores of other places also, angling for this fish by heaving and hauling through the surf is pursued as one of the most fascinating kinds of sport.

One of the greatest hits ever made by the United States Bureau of Fisheries in the planting of fish in new localities was the introduction of the Striped Bass into the coast waters of California. In 1879, 135 live fish were deposited in Karquines Strait, at Martinez, and in 1882, 300 more were planted in Suisun Bay, near the first locality chosen.

Twelve years after the first planting in San Francisco Bay, the markets of San Francisco handled 149,997 pounds of Striped Bass. At that time the average weight for a whole year was eleven pounds and the average price was ten cents per pound. Fish weighing as high as forty-nine pounds have been taken, and there are reasons for the belief that eventually the fish of California will attain as great weight as those of the Atlantic and the Gulf.

In 1925 California and Oregon caught and consumed 843,773 pounds of Striped Bass, worth $116,626,—a large decrease in output since 1897.

The records of the United States Bureau of Fisheries show a total catch about 1925 for the whole United States of 2,981,292 pounds, worth $510,097,—a falling off since 1897 of 3,015,590 pounds.

If this alarming decrease cannot be corrected by increased propagation, then it would seem quite clear that a three-year close season is in order, to give Nature a chance to correct the errors of man.

THE PERCH AND PIKE-PERCH FAMILY.

Per'ci-dae.

The festive little **Yellow Perch**[1] is, to the small angler, the next step upward from the

1. YELLOW PIKE-PERCH.
2. CHAIN PICKEREL.

sunfish—a sort of half-way fish on the road to the black bass and tarpon. And there is many a

[1] *Per'ca fla-ves'cens.* See illustration on page 383.

worse thing in the fishing line than a good string of golden-yellow and umber-brown Perch. When crisply and daintily fried in a small modicum of meal, and laid on hissing from the spider, they are "pan-fish" worth while; and they make up in delicacy and richness of flavor all that they lack in size. Except in famine times, an ounce of Yellow Perch is worth a pound of pike, carp or catfish.

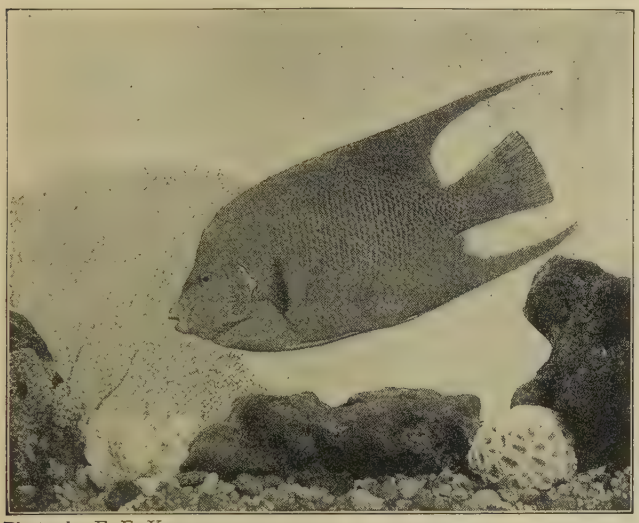


Photo. by E. F. Keller.

BLUE AND YELLOW ANGEL-FISH.

Hol-a-can'thus cil-i-ar'is, a tropical species, about 15 inches in length, which is one of the most beautiful fishes in the world. It represents the Family of Scaly-Finned Fishes, *Chae-to-don'ti-dae*.

Like egg-rolling rights on the White House lawn every Mayday, this neat little fish belongs to the small citizen; but in the great lakes and a few other places it is so numerous and so large, that it takes rank as a desirable market fish. It is at home in the northeastern quarter of the United States, north of the Ohio and Missouri valleys from Maine to Iowa and Minnesota. In most of the lakes, ponds and fresh-water bays of New England generally it is fairly abundant. Its rule of life is to bite at everything that is offered at the end of a line—angle-worm, minnow, grasshopper, frog-leg, trolling spoon, and fly, either natural or hand-made. The size of this fish varies from half a pound to three pounds, with a possible $4\frac{1}{2}$; and in length it measures from 7 to 12 inches.

The Yellow Pike-Perch[1] is frequently called the **Yellow "Pike"** and **Wall-Eyed "Pike";** but it is not a real pike at all. The real pike is a blood brother to the muskallunge. The Pike-Perches have *two prominent dorsal fins*, the real pikes only *one*.

Twice in trolling with hand-lines I have caught my spoon full of eel-grass. On hauling in to clear the tackle, each time the eel-grass turned out to be an eight-pound Yellow Pike-Perch. The first one came into the boat like a bunch of wet weeds. The second finally roused to a realizing sense of its position, and made quite a demonstration, but chiefly in the boat, endeavoring to climb out.

In the eastern United States, this is a northern fish that goes southward almost to the Gulf States. It is abundant in Lakes Ontario, Erie and Huron, and in many of the bays and larger streams attached to them, in which the water is clear, and the bottom of sand and gravel. By very many persons this fish is well liked as a food fish, and immense numbers are propagated every year. In 1900 the United States Bureau of Fisheries distributed, of this species, 89,700,000 eggs and live fish.

THE BLUEFISH.

[1] *Sti-zos-ted'i-on vit're-um.*

MISCELLANEOUS SPINY-FINNED FISHES.

The Bluefish[1] is a fish for men. To take it in orthodox fashion, go to treeless but delightful Block Island, pay your dollar-fifty, take deck passage on a low-browed, broad-beamed cat-boat, don a full suit of oil-skins, and set sail for blue water. If the wind is so light that the sailing is uninteresting, you get no fish. But if there is a stiff breeze, and you go up and down the eastern side of the island at racing speed, the Bluefish will come chasing after you to bite at your dummy fish, and give you a hundred thrills to the minute while you are hauling them in. If it happens that the bite of a bear has

THE SPANISH MACKEREL.

put two of the fingers of your right hand out of commission, that hand will have all it can possibly do to grasp the line adequately, and haul in.

Fishing for Bluefish in a good breeze—with not too much sea on—is like hunting mountain-sheep amid grand scenery. Half the sport is in the fine surroundings.

Drs. Jordan and Evermann say that this fish is found all the way from our coast to the Cape of Good Hope, the Mediterranean, the Indian Ocean and the Malay Archipelago, "a wandering fish . . . sometimes disappearing from certain regions for many years at a time." Professor Baird always considered it, of all our coast fishes, one of the most destructive to marine life, a genuine wolverine of the sea.

[1] *Po-mat'o-mus sal-ta'trix.*

The Bluefish swim in schools, ready to pounce upon anything edible that comes along. Once a cat-boat from which four of us were fishing sailed swiftly through a school. Within about five seconds, four fish struck in a rush that was practically simultaneous, and amid flying spray and general excitement, four vigorous victims of misplaced confidence were hauled aboard. A fish which is so greedy that it kills more fish-prey than it can use surely is a good fish to pursue for sport.

On our coast this fine fish is fairly common from Florida to northern Maine, ranging in size from 5 to 20 pounds. As a food fish it ranks on the bill of fare next to shad. Owing to its known voracity, it is debited with the annual destruction of an enormous quantity of other fishes. On the hook it is savagely courageous, and fights to the last.

During the past thirty years the annual catch of Bluefish has dropped from twenty million pounds to six million. In 1923 the total catch was 6,094,474 pounds, worth $887,736.

The Spanish Mackerel[2] may stand as a typical representative of the Mackerel Family (*Scombridae*), in which we find the *Common Mackerel* of the North, the *Kingfish* of our tropical waters, and the *Tuna*. It is a large and showy fish, colored silvery white and dark metallic blue, and no cruise in Floridian or Cuban waters is complete without it. It is a favorite in all markets reached by it, and in flavor it is a fair rival of the bluefish.

To every sportsman, the finest thing about this fish is the catching of it, on a one-hundred-foot line and a hook baited with that least appetizing of all baits this side of angle-worms—a white rag! Like the bluefish, the Spanish Mackerel and kingfish both bite best when the sails are well filled, and the boat is making about twelve miles per hour. In 1923 the total catch for the United States amounted to 6,563,479 pounds, valued at $531,767. This represents practically a four-fold increase, in pounds and value, over 1904.

It would require many pages to contain a really adequate life-sketch of this interesting fish, which ranges most erratically, in great schools—or in none at all—from the Gulf of Mexico to Block Island. It comes north only in the spring and

[2] *Scom-be-rom'o-rus mac-u-la'tus.*

summer, and does not go far into waters that are colder than 65°. (G. Brown Goode.)

Apparently, specimens taken in northern waters average much smaller than those taken around the two coasts of Florida. Dr. Goode says this fish "sometimes attains a weight of 8 or 9 pounds, though it rarely exceeds 3 or 4 pounds." A specimen of 3 pounds, 5 ounces, measured 26¼ inches in length. Drs. Jordan and Evermann give its weight as "6 to 10 pounds," with a maximum of all "seen" of 25 pounds weight, and 41 inches in length. ("American Food and Game Fishes.")

The great leaping **Tuna**[1] of the enchanted waters of Santa Catalina, "the tiger of the California seas," is, on our Atlantic Coast, the big but commonplace **Horse Mackerel, Tunny,** or **Great Albacore,**—no more, no less. It is the largest and now the most interesting member of the Mackerel Family.

Under the head of "Tuna" the United States Bureau of Fisheries commercially groups the *Albacore, Bluefin,* and *Yellowfin,* and the total annual product of this group runs up into huge figures. The catch as reported for one year about 1925 amounted to 40,212,712 pounds, valued at $3,804,365.

At Santa Catalina, bold men, and women, too, go out with rod, reel and line, to angle for Tuna, and vanquish Strength and Weight by Tackle and Skill.

This is hook-and-line fishing with a vengeance. The beginner hopes to catch a Tuna heavier than 100 pounds, in order to gain membership in the Tuna Club. The club member always hopes either to improve his own record, or break all others; but, record or no record, the button of the Tuna Club is a good thing to wear by right of conquest.

The sport in catching a Tuna *à la* Santa Catalina consists in bringing the monster within gaffing distance by the aid of the rod and reel alone. The hooked fish leaps into the air, or rushes seaward, or to the bottom, or plays on the surface like an escaped fire-hose,—in all directions at once.

The game consists in tiring out the fish without a break, and sometimes ten miles and ten hours of strenuous struggle are reeled off between the start and the finish.

[1] *Thun'nus thyn'nus.*

The beautiful waters of Avalon Bay, the bare and frowning mountain-sides rising like the walls of a rock-built coliseum, and the houses of the little town clustering at its foot like a gathering of living and interested spectators, make up a stage setting for the Tuna fisherman sufficiently romantic to quicken the sporting instinct of the most blasé tourist who ever swung a rod.

THE TUNA.

J. W. Jump's Tuna (117¾ pounds), taken on light tackle in 1924.

The late Mr. C. F. Holder, who once fought a "record" 183-pound Tuna throughout four hours and ten miles, said that the Tuna "when played with a rod that is not a billiard cue or a club will give the average man the contest of his life."

Concerning the kind of tackle in use by the members of the Tuna Club, and by himself, Col. C. P. Morehouse, of Pasadena, holder of the

Tuna championship record, kindly furnished the following statement in 1904:

"The most of the Tuna fishermen use a greenheart rod, as per the rules of the Club, viz., 6 feet 9 inches long, and a 16-ounce tip. As for myself, I prefer a split bamboo of the very best quality made. I caught the large Tuna (251 pounds) with the longest and lightest rod ever used for Tuna, viz., split bamboo, 7 feet 4 inches long, tip 12 ounces, with a 21-strand Cuttyhunk line on a reel made to order, to carry 300 yards. The time was 3 hours and 20 minutes. I do not think a lighter rod than the above would stand the strain necessary to capture a Tuna of 251 pounds, or even 150 pounds.

"The Tuna are hooked by trolling from light naphtha launches, and flying-fish are used for bait."

THE SILVER MULLET.

At this date (1927), the heaviest catches of Tuna by members of the Tuna Club stand as follows:

On heavy tackle:	Pounds.
Col. C. P. Morehouse, Pasadena, 1900	251
Mrs. E. N. Dickerson, New York, 1901	216
H. S. Dudley, Beverley Hills, 1921	198½
On light tackle:	
J. W. Jump, Los Angeles, 1919	145½
J. W. Jump, Los Angeles, 1924	117¾

The rules of the annual tournaments in which such records are made are very severe and strict. The angler must make his catch unaided, the fish must be reeled in, and a broken rod constitutes a disqualification. The rod must measure not less than six feet nine inches, the tip must not exceed sixteen ounces, the line must not contain more than twenty-four threads, and sustain a dead weight not exceeding forty-eight pounds.

On our Atlantic coast, the Horse Mackerel is not sought by anglers as a game fish. Its average length is put down as "about 8 feet." It feeds chiefly upon menhaden, and inasmuch as its appetite is in proportion to its size, it is considered very voracious. In its turn, this great fish is to the killer (*Orea gladiator*) an ideal food fish, and from the latter it receives special attentions which the Tunny would gladly forego.

One of the largest specimens on record, as vouched for by Dr. Storer, was taken in 1838, off Cape Ann, and measured 15 feet in length. Its weight of "one thousand pounds" was undoubtedly an estimate, only.

The Pompanos.—Following closely after the members of the Mackerel Family comes a large Family of deep-bodied fishes, with very small and narrow scales, deeply forked tails, and with the dorsal and anal fins prolonged to nearly, if not quite, one-third the entire length of the fish. They are really warm-water fishes, but often stray out of their regular haunts into colder waters. This Family includes the amber-jack, the cavallas, the moon-fishes, and several others. Of this Family, the following species is the best type:

The Common Pompano[1] is a delicious fish for the table, but unfortunately its mouth is so small it is next to impossible to take it with a hook. Once when penned up by bad weather in the mouth of New River, Florida, where this fish was abundant, we fished for Pompano until we almost starved. The "Silver King" tantalized us daily by showing himself at the surface, but his vagrant pounds of flesh were almost as far beyond our reach as the stars.

The Pompano is essentially a fish of the two coasts of Florida, and the northern half of the Gulf of Mexico. It is the most highly prized fish in the markets of its home waters, and as a rule the supply seldom is equal to the demand. The *Jacks* are more common. Several of the species found in this Family are characterized by the enormous thickness of their ribs,—a

[1] *Trach-i-no'tus car-o-li'nus.*

very peculiar character, which makes them look like ribs afflicted with elephantiasis.

Mr. John T. Granger, of Washington, regards the *Permit*, or *Great Pompano*[1] as a game fish well worthy of the attention of salt-water anglers, and believes that it will become a general favorite. A struggle with a 27-pound fish, taken with rod and reel at Miami, Florida, revealed to Mr. Granger the game qualities of the Permit.

The Mullet.—Throughout the sounds, and bays, and half-salt rivers of the Carolinas, Florida, and the Gulf states, the mullets are omnipresent and highly prized. When better fishes fail you, they can be depended upon to fill the dish; and you may go far without finding a more toothsome morsel than a **Silver Mullet,**[2] or **White Mullet,** freshly snatched from its native element with a fling of the cast-net that experience alone can give. If you wish to beguile the Silver King, you first catch a Mullet, or buy one, for bait.

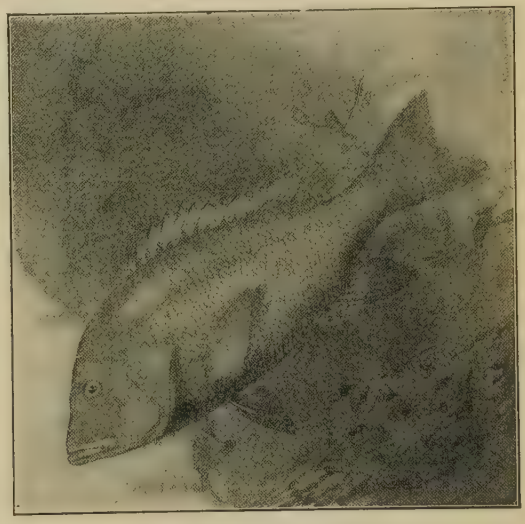
The name of this fish brings vividly to mind the balmy air and placid waters of Indian River, Florida, in February; a little, mangrove-clad archipelago along its eastern shore; herons quawking hoarsely in the green tangle, and small fishes of glistening silver jumping a yard high in front of a lotus-eater's boat. The Mullet leaps high in the air, gleaming and dripping, from pure joy in being alive amid such beautiful surroundings; and, having attained his zenith, he relaxes and falls back broadside upon the water, with a startling "*slap.*" In one quiet evening hour afloat, you may see thirty or forty Mullet leap out of water, and to some persons the sight is even more welcome than the flight of a bird.

The Silvery Mullet is a very trim little fish,—big-scaled, round-bodied and swift. In external appearance, it is very much like a pygmy tarpon, and quite as silvery. It is really a small fish, averaging about 9 inches in length, and as food for other fishes, and fish-eating birds, it is ideal. The brown pelicans of Pelican Island delight in this fish. When Mrs. Latham playfully squeezed the neck of a big, clumsy young pelican in the down, it promptly disgorged nine good-sized Mullet. I have seen a darter, with a neck one inch in diameter, swallow a nine-inch Mullet with relish and despatch.

[1] *T. goodei* [2] *Mu'gil bra-sil-i-en'sis.*

The Mullet genus (*Mugil*) contains about seventy species, widely distributed throughout the warm waters of the world. Besides the species mentioned and figured above, the *Striped Mullet* is also abundant in the waters of our southeastern coast. Both are important food fishes, and are caught in great numbers for the southern markets. They are taken in gill-nets and cast-nets, and the largest specimens rarely attain a weight of 6 pounds.

Of all North American fishes, the Mullets are fourth in commercial value. In 1923, the total catch amounted to 39,737,217 pounds, which sold for $1,608,610. The persistence of this fish in maintaining the Mullet supply is admirable.



THE RED SNAPPER.

THE SNAPPER FAMILY.

Lu-ti-an'i-dae.

The Red Snapper[3] brilliantly represents a large and important Family of valuable food fishes, which in our waters contains about 35 species. Many of these fishes are handsomely and showily colored, red being the commonest and most conspicuous tint, with yellow tints of frequent occurrence. A typical Red Snapper is recognizable a hundred feet distant by the clear and beautiful crimson color which completely suffuses it.

The average market specimen is about 16 inches long, but it is stated that this species

[3] *Lu-ti-an'us ay'a.*

attains sometimes a length of 3 feet, and a maximum weight of 40 pounds. In the Gulf of Mexico, says Mr. Silas Stearns, they very seldom exceed 30 pounds weight, and the average is 8 or 9 pounds. It happens, however, that one can spend months on the coast of Florida, and around Key West, without even once seeing a Red Snapper reaching 25 pounds in weight.

This fish prefers to live on a rocky bottom, in holes and gullies where all kinds of marine animals and fish are abundant. These gullies occur at a depth of from twelve to forty-five fathoms, and are most numerous in the northern border of the great level plain of sand which stretches out as the Gulf bottom from Cedar Keys toward the delta of the Mississippi.

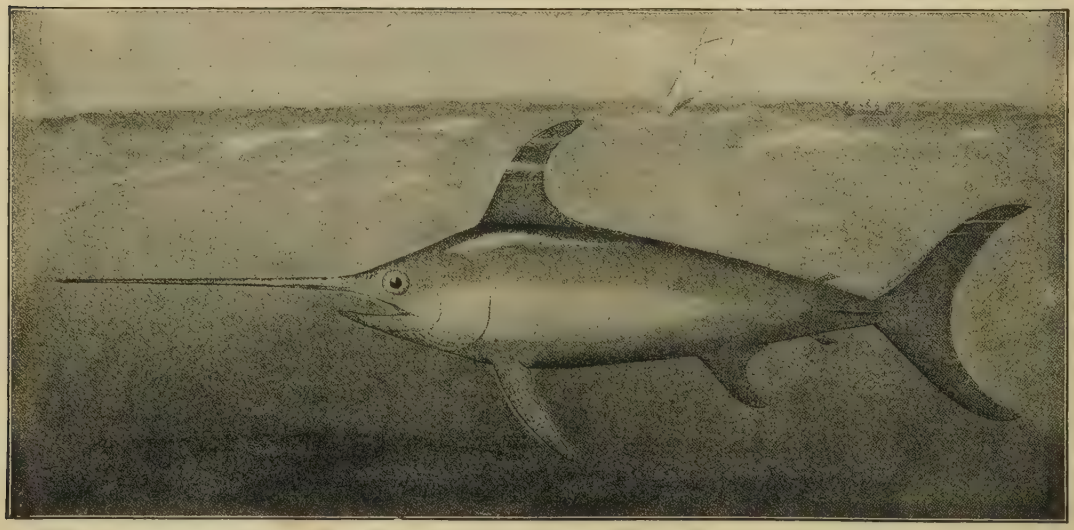
Within easy reach of Jacksonville, Florida, are fishing-banks so well populated by the Red Snapper, and other fishes, also, that excursions are made to them with great success. Dr. C. J. Kenworthy described for Dr. Goode ("Game Fishes of North America") a day's sport twelve miles off shore from Mayport, which for eighteen fishermen yielded 208 Red Snappers averaging 25 pounds each. The bait used was bluefish, young shark or skip-jack. The only serious drawback to this fish is the fact that "it should always be boiled, or cooked in a chowder."

In 1923 the Gulf Coast and South Atlantic States caught 11,848,615 pounds of Red Snappers, worth $873,264.

ODD FISHES OF THE SPINY-FINNED ORDER.

The "Dolphin"[1] of this Order is a fish, not a cetacean of the Class of Mammals; and its unfortunate popular name and sea-going habits cause between it and the true dolphins much confusion.

This is the mid-ocean fish with a long, paddle-like body, a dorsal fin which reaches in one unbroken sweep from head to tail, and which possesses when alive the wonderful iridescent colors which have tested the descriptive powers of so many voyagers.



THE SWORDFISH.

This is the terror and destroyer of the flying fish. The "Dolphin" pursues it with tremendous speed and perseverance, often taking long leaps out of the water, until the victim is exhausted, overtaken and devoured.

The colors of the "Dolphin" are a mixture of all the colors of the solar spectrum, revealed with the metallic lustre and iridescence of the opal and the reticulated python. The fully grown fish is from 5 to 6 feet in length, and in contrast with the ordinary sailing-vessel diet

[1] *Cor-y-phae'na hip-pu'rus.*

of salt meat, its flesh is a delicacy. To the writer it was a red-letter day when with a new artificial flying-fish, fresh from the horny hand of an old sailor named "Porpoise George," he caught his first "Dolphin," in mid-ocean, from the deck of the *Golden Fleece*.

The Swordfish[1] needs neither preface nor introduction, for his sword serves all such purposes.

In the government museum at Singapore is a three-inch-thick section of copper-sheathed oak plank, cut from the side of a ship, which has sticking through it the sword of a Swordfish. Now, the material of such a sword is by no means so hard that it could by ordinary means be forced through three inches of the hardest kind of oak planking, sheathed with copper. The fact of clean penetration implies a speed of not less than sixty miles per hour, and perhaps more. With such locomotive powers, and such a weapon for slaughter, it is fortunate that its owner has not been fitted out with the teeth and appetite of a killer, else the cetaceans would soon be exterminated.

The Swordfish well understands the offensive and defensive value of his sword, and there are on record many well-authenticated instances wherein this pugnacious creature has driven its formidable weapon through the sides or bottoms of small boats, to the peril of the occupants. The majority of such incidents have occurred to boats regularly engaged in swordfishing, which is a noteworthy industry on our Atlantic coast.

Broken swords have been found in the sides and bottoms of quite a number of ships. In 1871, the fishing yacht *Redhot*, of New Bedford, was pierced and sunk by a Swordfish which had been hauled alongside to be killed. In 1875, a Swordfish drove its sword through the bottom of a fishing schooner off Fire Island, and stuck fast. Before the fish had time to free itself by breaking off its sword, the fishermen cast ropes about it, and secured it. Its length was over 11 feet, its weight 390 pounds, and the length of its sword, 3 feet 7 inches.

The Swordfish is a food fish of very good standing in New England, where it is sliced and salted, and widely esteemed. In 1925, the total catch for the United States was 2,954,124 pounds, valued at $540,702.

The food of this fish consists of menhaden, mackerel, bonitoes, bluefish, herring, whiting and squids.

The Sucking-Fish, or **Remora,**[2] is a high-class parasite, who does much of his travelling at the expense of sharks who would eat him if they could. In one of her odd freaks of merry-making, Nature fashioned on this creature's head a large, flat disk, set crosswise with rows of delicate spines, all pointing backward. It is really a peculiar development of the first dorsal fin. When the Sucking-Fish desires to travel and see the sea-world, it hunts up the nearest shark, swims alongside from the rear, claps its head to the shark's side, and sticks fast. The faster the shark glides through the water, the more tightly clings the automatic tramp. Like a passenger in a Pullman sleeping-car, the Remora can bid the world good-night, and go to sleep serenely confident that he will get on in the world, even while he sleeps. It is as if a human tramp were provided by Nature with means enabling him to cling automatically and comfortably to the side of a moving freight-car, instead of walking in dust and sorrow upon the ties.

The Remora is not a large fish, its usual length being under two feet. Not only is it a parasite of sharks and other large fishes, but it attaches itself to the sides of ships. It is said that sometimes sharks actually become emaciated through prolonged labor in furnishing free transportation for lusty Remoras. The parasite is himself a good swimmer, and the best reason assignable for its strange habit in clinging to sharks is its desire to gather in fragments of the feast when the latter makes an important killing. The Remora is an inhabitant of our Atlantic coast, the Gulf of Mexico, and the West Indies generally, but it is not considered a food fish.

[1] *Xiph'i-as glad'i-us.* The pronunciation of the generic name is Zif'e-as.
[2] *Re-mo'ra bra-chyp'ter-a.* See figure on page 432, of an individual attached to a mackerel shark.

CHAPTER XLVI

THE ORDER OF PIKES

HAPLOMI

After the Order of Spiny-Finned Fishes, with its great array of genera and species, it is a relief to reach an Order which contains but one Family, and only five species. The so-called Yellow "Pike" is not a member of this aristocratic and exclusive Family; for, as already stated, it is only a pike-*perch*.

Look at any member of the Pike Family, and tell me whether it does not make you think of a pirate. Observe that yawning sepulchre of a mouth, that evil eye, and low, flat forehead—all indicating a character replete with cunning and ferocity. Note the total absence of a dignified and respectable *front dorsal fin*, which nearly every fish of proper moral character possesses and displays with pride.

THE MUSKALLUNGE.

Like scaly assassins, the pikes and pickerels lie in wait for their prey; and whenever one rushes like a green streak from under the lily-pads, and bolts a trolling-spoon in one great, ill-mannered gulp, the angler feels a savage delight in thinking that it serves him right. These fishes are the most voracious creatures that inhabit our inland waters. Their ambition is to devour every living creature that comes in sight, and they prey upon all other fishes, frogs and amphibians generally, ducklings, other small aquatic birds, and also small aquatic mammals. Worse than this, they even devour their own kind. That they are found living with the bass, perch and other fishes is generally due to the fact that it is impossible for them to devour all their neighbors.

The Pike[1] is a fish of very wide—almost world-wide—distribution. In America it is found from Kodiak Island, Alaska, southward through British Columbia, Canada, the upper Mississippi valley and the Great Lakes region, to Europe and Asia. Dr. Jordan says ("Food and Game Fishes") that it reaches a length of 4 feet, a weight of 40 pounds, and that the Kankakee River, in Illinois, is one of the best streams for great Pike fishing of which he knows. As a food fish the Pike ranks low.

The Muskallunge[2] is a game fish of high rank, and its Indian name is spelled in eight different ways. Its standing may be expressed in the following proportion: *The Muskallunge is to the fresh-water angler as the tuna is to the salt-water angler.*

Its great size makes it a great prize, and the taking of a large fish with sportsman-like tackle, and a very good chance to be upset in deep water during the struggle, makes the Muskallunge the king of fresh-water game fishes. The northern species—of the Great Lakes, the St. Lawrence and southern Canada—reaches a length of 7½ feet, or more, and attains a maximum weight of about 90 pounds. Its centre of abundance seems to be in the Thousand Islands of the St. Lawrence, where it affords grand sport. Usually it is caught by trolling,—a most delightful scheme by which the twin pleasures of boating and fishing are combined.

[1] *E'sox lu'ci-us.* [2] *E'sox mas-quin-on'gy.*

The Chautauqua Muskallunge[1] is a species quite distinct from its more northern relative. It is confined to Chautauqua Lake and a few localities in the Ohio valley—a comparatively small area. In that landlocked region, far from the shad and the bluefish, it is by many persons considered a fine fish for the table.

The Chain Pickerel[2] is so common throughout the region bounded by Maine, Florida, Arkansas and Minnesota, that it is difficult to say where it is not found. It is so well and so widely known that it requires neither introduction nor description. On the lovely lakes of central Michigan, and New York, to stand up in a boat that is properly handled, and throw a trolling-spoon along the borders of the lily-pad archipelagoes, where the Pickerel hide, is good sport. In the crystal-clear water the whirling, glittering spoon is in sight every moment, and you can see the rush of the Pickerel when he flies straight as an arrow at the lure. This fish is so voracious that several kinds of bait are effective for it; but I see no reason for calling its flesh a delicacy. Its maximum size is about 28 inches, which is considerably larger than the little *Brook Pickerel* of the northern Mississippi valley.

In a period of twelve months ending in 1925, the total market catch of Pike and Pickerel amounted to 677,184 pounds, worth $57,769. The moral character of the Pickerel is bad, and his shortcomings on the table place him far down in the list of the best game fishes.

[1] *E'sox o-hi-en'sis.*
[2] *E'sox re-tic-u-la'tus.* See illustration on page 387.

CHAPTER XLVII

THE ORDER OF TROUT AND SALMON

ISOSPONDYLI

This grand Order is represented in North American waters by 135 full species of fishes, all decidedly edible, and the majority of them are classed as "game" fishes. It includes not only some of the most choice of all our finny tribes, but also others whose commercial value is of the highest rank. In it are found the trout, salmon, whitefish, shad, herring, menhaden and tarpon. Despite the great number of species in the Spiny-Finned Order (446), it seems highly probable that their combined value in the markets falls far below the aggregate for the Order now under consideration. On the Pacific coast, the value of the annual salmon catch alone is, at this date, about $31,989,531, whereas the annual value of the cod, the most valuable food fish of the Atlantic, is only $2,958,232.

Reminding the reader once more that we are endeavoring to present groups in the order of their natural rank and importance, we present first in this Order of fishes the Family of highest interest and value.

THE SALMON FAMILY.

Sal-mon'i-dae.

The Salmon Family contains all the trout, salmon and whitefishes, to the number of thirty-two full species and twenty-nine subspecies. Of these three groups, the first is celebrated for the beauty of form, picturesque surroundings, and gamy qualities of its members. The salmon and whitefish are noted chiefly for their great value as food.

Few persons, it is safe to say, know either the size or the subdivisions of the group of American trout and charrs. The species are numerous, beautiful, and widely distributed north of a line drawn from New York City to San Diego, California. For a clear and correct understanding of these fishes, a diagram is absolutely necessary. The world is indebted to Dr. D. S. Jordan, President of Leland Stanford University, for the researches which have made him the leading authority on this large and extremely interesting group of fishes, and by means of which it has been made comprehensible.

Of North American trout, generally, the centre of abundance is certainly west of the Rocky Mountains, and the group as a whole is decidedly of the Far West. The trout of the eastern United States are but the advance guard of the main body which fills the swirling mountain streams and lakes of the Rocky Mountain region and the Pacific coast. Our famous and well-beloved speckled trout of the East is but a trifling incident in comparison with the many fine species found in the true home of the Trout Family.

Dr. Jordan believes that our original stock of trout came to us from Asia, and "extended its range southward to the upper Columbia, thence over the continental divide via Two-Ocean Pass to the Yellowstone and the Missouri Rivers, the Platte, Arkansas, Rio Grande and Colorado." He actually caught Yellowstone trout in Two-Ocean Pass, on the top of the great continental divide, "in the very act of going from Pacific into Atlantic drainage."

The Mountain Trout, or Black-Spotted Trout.[1]—Like many others, this is a fish of many names,—Spotted, Black, Silver, Salmon, Steelhead and Cut-Throat,—all ending with Trout. The last mentioned,—"Cut-Throat Trout,"—Dr. G. Brown Goode characterized as "a horrible name, which it is hoped will never be sanctioned in literature." And why "Cut-Throat," any more than Ripper Trout, or Wife-Beater Trout?

Surely this fine fish, which Dr. Jordan considers probably the parent from which all others of this group have been derived, is worthy

[1] *Sal'mo clark'ii.*

of a dignified and respectable name. It is a fish of large size, attaining a length of 3 feet, and a weight of 30 pounds. It is *the* fish of the Rocky Mountain region, and occurs in nearly every lake and important stream of Montana, Wyoming, Utah, Colorado, New Mexico, Idaho, Oregon, Washington and northern California. It reaches the sea from Mount Shasta northward to Puget Sound, and beyond. "Those that live in the depths of shady lakes are almost black, while others are pale. Those in the sea are silvery, or only faintly spotted." (G. Brown Goode.)

In the most representative specimens of this species, the upper half of the body is abundantly spotted with small, round, and rather regular black spots.

The Rainbow Trout[1] is a fish of real beauty, comfortable size, fine flavor, and easy to propagate artificially. On this side of the Rocky Mountains, however, it is not politic to assert that it is more beautiful than the brook trout; but Dr. Jordan says that "by many anglers it is regarded as the greatest of all game fishes." It "reaches a weight of half a pound to 5 or 6 pounds, though in most of the streams in which it is found it rarely exceeds 2 or 3 pounds." It bites readily, but when hooked makes a gallant fight to escape, rushing, leaping, and shaking its head vigorously to expel the barb.

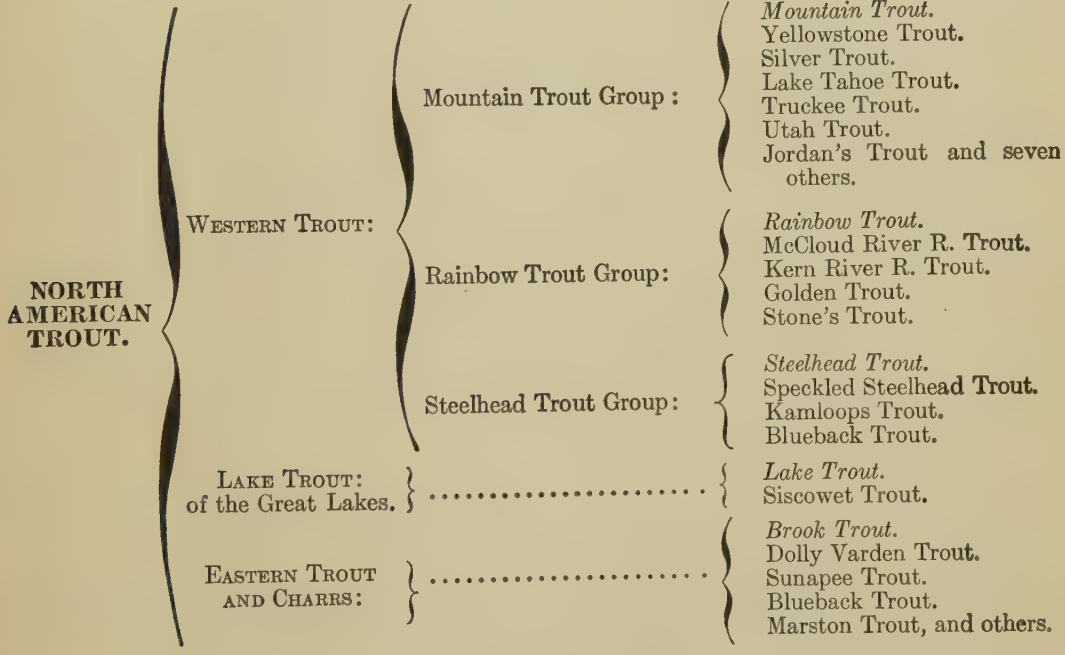
In appearance, this typical Rainbow Trout is like an elegant little salmon from 15 to 18 inches long, with spots along its upper body like those of the eastern brook trout, and sides like a section of a rainbow. It is found only in the small brooks of the coast ranges of California, from Klamath River to San Diego. It takes a fly with a degree of readiness which "will please the most impatient of inexperienced amateurs."

The group of Rainbow Trout contains six species all told, the others being the *Western Oregon Brook Trout*; the *McCloud River Rainbow Trout*, which is the species propagated by the United States Bureau of Fisheries; the *Kern River Trout*; *Golden Trout* of Mt. Whitney and Kern River, which Dr. Jordan considers the most beautiful of all, and *Stone's Trout*. All

[1] *Sal'mo ir-id'e-us.*

SUBDIVISIONS OF THE NORTH AMERICAN TROUT AND CHARRS.

(Species in italics are introduced in the text.)



these species are found only along the Pacific coast, between Washington and southern California.

RAINBOW TROUT.

The Steelhead Trout,[1] and its group.—The fish which represents this group is of commanding size, and of high value as a food fish. Its other names are **Salmon Trout** and **Hardhead.** It reaches a maximum weight of 14 pounds, but usually its weight is between 5 and 8 pounds. It "ranks very high as a game fish, and trolling for Steelheads in the bays, sounds and river mouths along our Pacific coast affords excitement and pleasure exceeded among the *Salmonidae* only by trolling for Chinook Salmon." (Jordan and Evermann.)

This fish is regularly propagated by the United States Bureau of Fisheries, by which it has been successfully planted in Lake Superior. Great numbers are caught every year in the Columbia River, and canned for the eastern markets. It is found in the streams flowing into the sea along the coast of California, from southern California to Alaska. Its scales are small, its form is salmon-like, and its color is silvery, with a wash of rose-pink down the sides.

The Great Lake Trout, or **Mackinaw Trout,**[2] and its group.—This fish is the largest of all trout. Its usual weight is from 15 to 20 pounds, but it reaches a maximum of 125 pounds. Its color is dark gray, varying most erratically from pale gray to almost black. Its irregular and very numerous spots of gray mark this fish very distinctly, for they cover not only the body but all the fins save those under the body.

As its name implies, this is essentially a fish of the Great Lakes, and for many years has been the principal source of fresh-fish supply for a large area in that region. In its own field its only rival in commercial importance is the whitefish. Usually the flesh of the latter is supposed to be a greater delicacy than the other.

The Lake Trout has passed through two or three very interesting periods. From 1880 to 1886, commercial fishing for Lake Trout was carried on so persistently that the supply showed alarming signs of exhaustion. Here the United States Bureau of Fisheries stepped in, and along with state hatcheries began to propagate and distribute this species. This work was continued until many millions of fish eggs had been planted in the lakes. After that, the supply of Lake Trout increased so rapidly that presently the markets were overstocked, and the price dropped accordingly.

More recently, however, the pendulum has swung the other way. All around the Great Lakes the demand for food fishes is now so great and so permanent, that the natural supply has proven unable to meet it. Nature cannot produce food fishes in the lakes in the enormous quantities required, even though in 1922 the yield of Lake Trout was 13,726,959 pounds, worth $1,647,662. This was an actual increase over the year 1896 of three million pounds; and it is a very encouraging exhibit of fish conservation.

"Lake Trout spawn on the reefs, and at other times live in deep water. In Lake Superior the spawning season begins in late September. In Lakes Huron and Michigan, the height of the season is early November, and spawning continues until December. The spawning grounds are on the reefs of 'honey-comb' rock, 10 to 15 miles off shore, and in water from 6 to 120 feet deep. The number of eggs produced is not large. A 24-pound fish produced 14,943 eggs, but the usual number does not exceed 5,000 or 6,000." (Jordan and Evermann.)

The range of this fish is from New Brunswick and Maine westward throughout the Great Lakes to Vancouver Island, B. C., and northward to Labrador, Hudson Bay and northern Alaska.

[1] *Sal'mo gaird'ner-i.*
[2] *Cris-ti-vo'mer nam'ay-cush.*

Drawn by W. L. Steward.

THE BROOK TROUT.

Deep-Water Fishing for Lake Trout.—"The Siscowet of Lake Superior is taken by the commercial fishermen in very deep water, the nets being lifted by steam power. The nets are set well out toward the centre of the lake, at depths frequently as great as 500 feet. About forty nets, each over 600 feet long, are set in one 'gang,' constituting practically a single gill net considerably over four miles in length. Each end of each gang is buoyed.

"The average steam fishing-boat attends to five gangs of nets, lifting one each day. Each gang, therefore, remains in the water five days before it is lifted. As the net comes up around the steam windlass forward, it is passed aft and immediately reset by being paid out over the stern by two members of the crew. The nets are about eight feet wide, and the mesh is 4½ inches.

"The largest Lake Trout I observed on the *Currie* was 2 feet 10 inches long, and its weight was 21 pounds. The average length of the fishes taken during my inspection was less than 2 feet." (Charles H. Townsend.)

The Brook Trout, or **Speckled Trout,** and its group.—Concerning this beautiful and high-spirited creature, so much has been written it would now seem that there is nothing untold. But this is a very wide country; and I ween that in the real West there may be a million of good citizens who are strangers yet to *Sal-ve-li'nus fon-ti-nal'is.*

After all has been said, I think it must be conceded that this is the most beautiful of all our game fishes. Its back and dorsal fins are elegantly marbled, its sides have about fifteen or twenty crimson and black spots, and its pectoral, ventral and anal fins are bright crimson, edged in front with white. Its general ground color down to the latitude of the pectoral fin is dark olive, below that comes sunset pink, and underneath all is the silver white of the belly.

Along with its beauty, agility, and general gaminess, this fish makes its home in the most picturesque and beautiful streams its range affords. Its ideal haunt is a deep, clear pool at the foot of a picturesque rush of water over mossy bowlders. Usually this forest jewel is delightfully set in the foliage of overhanging

birches, beeches and maples, and well backed by the forest shadows that painters love. Usually the music of rushing water pervades the haunt of the Brook Trout; and the only cloud upon it all is that, ever and anon, Man, the supposedly high-minded, savagely bends every energy to kill an unduly-great number of these beautiful creatures, and fills a sordid creel entirely too full.

Most unluckily for the Trout, it is its habit to be ever on the alert for insects on the surface of its pool, and "rise to a fly." To the high-class sportsman who scorns the humble angle-worm, the accurate throwing of a small fly for a very long distance, solely by the exercise of great skill and judgment, is the crowning attraction in seeking the Brook Trout in its haunts. The skill required in fly-fishing is enough to tempt any man who has ever felt the electricity that every good fly-rod is charged with; and it is no wonder that men love to fish for this very beautiful fish, in the most charming of all sylvan situations.

The Brook Trout was once a habitant of the northeastern United States, northward of a line drawn from New Jersey to Minnesota, into Labrador, Canada and Manitoba; but to-day, where is it? Ask the "fish-hog" who spares no Trout that is big enough to lift from a platter. Ask the market fishers, who fish and fish to supply hotels and restaurants, in season and out of season.

In its wild state, this fish is doomed to disappear at an early date. We have now in this country a large and rapidly increasing element the members of which have come to us to slay and eat. To them, the preservation of wild life *to look at* seems like childish folly. These, and others like-minded, are raking our trout-streams with fine-toothed combs, and mean that nothing larger than a trout egg shall escape. And the end will be that in a very few years the wild Brook Trout will be as nearly extinct as the wild buffalo.

THE SALMON GROUP.

The salmon were made for the millions. The Siwash Indian eats them fresh in summer, dries them, and later on freezes them, for himself and his dogs in winter. The epicure pays for having the fresh fish shipped in ice to his table, wherever that table may happen to be. In mid-ocean, the great American canned salmon is often the best and only fish afloat. In the jungles of the Far East, in the frontier bazaar of the enterprising Chinese trader, it "bobs up serenely" to greet and cheer the lonesome white man who is far from home and meat markets. Even in the wilds of Borneo its name is known and respected; and he who goes beyond the last empty salmon-tin, truly goes beyond the pale of civilization. The diffusion of knowledge among men is not much greater than the diffusion of canned salmon; and the farther Americans travel from home, the more they rejoice that it follows the flag.

The common salmon of Europe, and also of Labrador and New England, was accounted a wonderful fish, both for sport and for the table, until the discovery of the salmon millions of the Pacific coast effectually cheapened the name. To hold their place in the hearts of sportsmen, game fishes positively must not inhabit streams so thickly that they are crowded for room, and can be caught with pitchforks. Yet this once was true of the salmon in several streams of the Pacific coast. The bears of Alaska grow big and fat on the salmon which they catch with the hooks that Nature gave them.

The salmon species of North America are as follows:

- AMERICAN SALMON.
  - ATLANTIC Species:
    - Atlantic Salmon. (Of Europe and N. America.)
    - Ouananiche. (The leaping fighter.)
    - Sebago.
  - PACIFIC Species:
    - Quinnat, or Chinook. (Most valuable species.)
    - Blueback, or Sockeye. (Second in value.)
    - Silver, or Coho. (Third; flesh white.)
    - Humpback, or Gorbuscha. (Of little value.)
    - Dog, or Kayko. (Of least value.)

The five species of Pacific coast salmon form a remarkable group. They lead all fishes in annual commercial value ($31,989,531); they are the most abundant of all fishes that inhabit fresh water; they traverse very great distances

to reach their spawning beds, and they all die immediately after spawning!

The sea is the home of all the Pacific salmon, and except when the young are floating toward it from their birth-place, it contains their food. Of their life in the sea, little is known. They are nowhere numerous, and trolling for them in salt water is interesting sport.

Throughout the months of spring and summer, the salmon leave the sea, enter the large rivers,—and many small ones, also,—and proceed upward for hundreds of miles, to deposit their eggs as far as possible from salt water. In the Columbia and Yukon Rivers, and their tributaries, it "is the habit of salmon to ascend for *a thousand miles* or more before spawning!"

The "run" begins with the advent of spring, when the salmon travel up the rivers until they can ascend no farther. It is on these runs that the fish congregate in such incredible numbers that sometimes they actually crowd each other, and can be photographed *en masse*. They rush up rapids, and if cascades or low waterfalls are encountered, they leap atop of them with a display of energy and activity that is, when first heard of, almost beyond belief.

"When the Pacific salmon reach maturity," says Mr. Cloudsley Rutter, in "Country Life," "they seek fresh water to spawn. As soon as they leave their accustomed salt-water food, they stop eating. It is not uncommon for fishes of the Salmon Family to fast during the breeding season, but the Pacific salmons never taste food after leaving salt water, and their fast ends only with death. This is true of all species of Pacific salmons, and is without a parallel among the higher fishes.

"As the salmon advances into fresh water, the digestive organs shrivel to one-tenth their natural size, all the fat disappears from the tissues, the flesh turns white, and the skin thickens and embeds the scales till they cannot be seen. By the time spawning begins the fish has lost about twenty per cent of its weight, and sometimes much more. In fresh water, the jaws of the males become much prolonged and hooked, and large canine teeth appear. The body becomes deep and slab-sided; and the skin turns reddish in most species. No individual of either sex of any species of Pacific Salmon ever returns to the ocean after spawning."

Concerning the Chinook salmon, Drs. Jordan and Evermann say that the run begins in the Columbia River as early as February or March. The fish move up without feeding, travel leisurely at first, but as they advance farther they move more rapidly. Many of them pause not until they have found satisfactory spawning beds in the Snake and Salmon Rivers, among the Sawtooth Mountains of Idaho, more than 1,000 miles from the sea. "Those which go to the head waters of the Snake River spawn in August and early September; those going to the Big Sandy in Oregon, in July and early August; those going up the Snake to Salmon Falls, in October; while those entering the lower tributaries to the Columbia, or small costal streams, spawn even as late as December."

THE QUINNAT SALMON.

"The spawning extends over several days, the eggs being deposited upon beds of fine gravel, in clear, cold mountain streams." The temperature of the water must be about 54°, and if on arrival it is much above that, the fish wait until it lowers. ("American Food and Game Fishes.")

A very remarkable feature about the spawn-

ing of the salmon is that after it is completed, both males and females *die!* "This," says Jordan and Evermann, "is true of all, whether spawning remote from salt water, or only a few miles, or yards, from the sea," and whatever the cause may be, it "is general in its application to all the Pacific coast salmon."

Inasmuch as the bodies of many dead salmon show injuries of many kinds, the belief has become prevalent that the fish injure themselves by striking against rocks on the run upstream, and ultimately die from wounds so received. But the investigations of Drs. Jordan and Evermann have completely disproved this. It was found that of the many salmon examined immediately after arrival on their spawning grounds in central Idaho, not one showed any bruises or mutilations, and all were in excellent condition. The mutilations which subsequently were observed were obtained either by fighting, or by pushing the gravel about on the spawning beds.

Salmon eggs hatch in about fifty days. During the first six weeks, the egg-sac supports the life of the alevin, which lives quietly on the spawning bed. By the end of six weeks the yolk-sac is absorbed, and the young fry begins to float down stream toward the sea. When the journey is very long, the trip occupies several months, or even a year; and when the young salmon at last reaches salt water, it is four or five inches long, and is known as a "parr." Of course the young salmon feed all the way down, on a fresh-water menu.

Naturally the salmon millions of the Pacific streams early attracted the attention and aroused the avarice of men who exploit the products of Nature for gain. As usual, the bountiful supply begat prodigality and wastefulness. The streams nearest to San Francisco were the first to be depleted by reckless over-fishing, and now some of the fishermen of California solemnly aver that the sea-lions are largely to blame for the depletion of the Sacramento salmon fishery! It is the rapacious and deadly net and salmon-wheel, not the squid-eating sea-lion, that is to blame. Regarding the conditions that in 1901 prevailed in Alaska, the following notes by Mr. George Bird Grinnell in the "Harriman Alaska Expedition" are of interest:

"The salmon of Alaska, numerous as they have been and in some places still are, are being destroyed at so wholesale a rate that before long the canning industry must cease to be profitable, and the capital put into the canneries must cease to yield any return.

"The destruction of salmon comes about through the competition between the various canneries. Their greed is so great that each strives to catch all the fish there are, and all at one time, in order that its rivals may secure as few as possible. . . . Not only are salmon taken by the steamer load, but in addition millions of other food fish are captured, killed and thrown away. At times, also, it happens that far greater numbers of salmon are caught than can be used before they spoil. A friend of mine told me of the throwing away of 60,000 salmon at one time, near a cannery in Prince William Sound, in 1900; and again the similar throwing away of 10,000 fish. So something like 700,000 pounds of valuable fish were wasted."

In the vast upset caused by "the war" in the American food supply and the family budget of the cost of living, the salmon of Alaska did not escape the universal scourge of high prices. The soaring cost of beef, pork, mutton and domestic poultry also gave wings to the fishes of all our waters. The demand for canned salmon, ever growing with our increase in population, and in popular appreciation of that wonderful food, stimulated the Alaskan canning companies to their utmost efforts.

The result usual to the unusual exploitation of natural products soon precipitated a crisis in the salmon canning industry. In a certain year we noticed that the annual "bag" of salmon by the total canneries reached only about one-half the "bag limit" of cases permitted for that year by the federal government. That of course could mean only one thing,—a 50 per cent scarcity of salmon!

The salmon question was at once taken up by Congress, investigated, and better regulated. The total catch for 1926 is amazingly great, and a layman can form no expert opinion on the question of salmon endurance. Is it possible that the salmon millions can maintain, year after year, an annual catch of 4,459,937 cans? Or, are we presently due for another shock from figures representing alarming depletion? The balance of salmon supply and demand must be preserved.

The Quinnat Salmon,[1] also called *Chinook, California, King, Columbia River* and *Sacramento Salmon,* is the largest, the most widely distributed and the most valuable of the Pacific Salmon. Frequently it attains a weight of 50 pounds, and specimens have been taken in Alaskan waters weighing about 100 pounds. Its average weight is between 20 and 30 pounds. It is found from Monterey Bay, California, up the whole Pacific coast to Bering Strait, and down the Asiatic coast to China.

The Blueback Salmon,[2] also called *Sockeye, Nerka, Redfish* or *Red Salmon,* is the most abundant species, and in flavor and general importance it stands next to the preceding. In Alaska it is of greater value than all other species combined. Its flesh is of a rich red color, full of oil, and of fine flavor. In size it is small for a salmon, its average weight being only about 5 pounds. Its geographic range is from the Columbia River to Japan, and it is the species most abundant in the canneries along the Fraser River and the shores of Puget Sound. In 1926 the number of cases of Red Salmon canned in Alaska was 2,157,087.

In Alaska the abundance of the Blueback is almost beyond belief. A catch of 10,000 fish at one haul is of common occurrence; 25,000 at a haul is not uncommon, and 50,000 are taken at least once every year. The record haul was made in 1896 when about 100,000 were taken, of which 60,000 were used and the remainder liberated. (Cloudsley Rutter.)

The *Little Red Fish* of various lakes in Idaho, Oregon and Washington, wherein they reside continuously, are now regarded by Dr. Jordan as small and immature specimens of the Blueback Salmon. Like all others of their genus, they die immediately after spawning, sometimes bearing body bruises, and again quite free from them.

The Silver Salmon[3] stands third in the list. Its other names are *Kisutch, Hoopid, Skowitz, Coho Salmon* and *"White Fish."*

The range of this fish is from California to Japan. It is next in size to the quinnat, but inferior in flavor, and its flesh is pale. It is a good fish to ship fresh, and despite the fact that when canned it is not highly esteemed, great quantities are canned in Oregon and Washington, and marketed as "medium-red Salmon." In 1926, the output canned in Alaska was 202,527 cases.

The Humpback Salmon,[4] also called the *Gorbuscha, Holia, Hone,* and *Haddoh Salmon,* ranges from the Sacramento to Kamchatka. It derives it best name from the fact that "upon the approach of the breeding season, the back of the male grows higher than it usually is, and forms an abrupt hump back of the head," at which time the flesh is valueless.

Formerly this fish was not highly regarded by the canning establishments, and was but little used. As a matter of fact, its flavor when fresh, in the spring, is by some experts, of whom Mr. C. H. Townsend is one, considered fully equal in flavor to that of any other salmon. To-day it is receiving its full share of attention from the canning establishments, and is now quite on the market. Its place now and in the future is clearly indicated by the fact that in 1926, 3,338,349 cases were prepared for the market. In 1900 the number of cases of this species canned in Alaska was only 232,022.

The Dog Salmon[5] is the least valuable of the Pacific Salmon. Its flesh is of such poor flavor that formerly it was ignored by the canners. Now, however, it is being put up under various names that are not its own, such as "Chum Salmon." This fish is also called *Hayho, Lekai, Qualoh,* and *Calico Salmon.* Its range is from Sacramento to Kamchatka; and in the rivers of Japan it is the most common species. Its weight is from 10 to 12 pounds.

As previously observed, the Salmon of the Pacific coast far surpass in commercial value all other American fishes. Their accessibility renders their capture little more than a mechanical operation, and eventually it will result in the practical destruction of the salmon industry. Americans seem utterly unable to conserve for perpetual benefit any particularly valuable form of wild life.

The records of the salmon industry for the

[1] The scientific name of this fish, *On-co-rhyn'chus tscha-wyts'cha,* is presented with an apology to the reader. The specific name is useful only as an example of the disgusting barbarism to which an ill-balanced mind can sometimes descend in choosing names.

[2] *On-co-rhyn'chus ner'ka.*

[3] *O. ki'sutch.*

[4] *On-co-rhyn'chus gor-bus'cha.*

[5] *O. ke'ta.*

years 1899 and 1926 are of universal interest. They are as follows:

Of Pacific Salmon, Alaska produced 118,622,230 pounds in 1899, and 319,338,836 pounds in 1926.

Of Pacific Salmon, California, Oregon and Washington produced 130,004,835 pounds in 1899, and 40,115,424 pounds in 1926.

To-day the question is, shall we permit this industry to go by default, and be ruined in a few years? Or shall we conserve it sensibly and properly, both for ourselves and future generations?

The Atlantic Coast Salmon.—It is now necessary to call this fish the **Atlantic Salmon**[1] in order to distinguish it from the Pacific species; but for two centuries it held its place in literature as *the* Salmon. It once inhabited many portions of northwestern Europe, and in some it still survives.

Drawn by W. L. Steward.

THE SEBAGO SALMON.

In North America, its natural habitat was originally from the mouth of the Hudson River northward throughout the coastal rivers of New England, Canada, New Brunswick, Nova Scotia, Newfoundland, and Labrador to Greenland. Once very abundant in the Connecticut River, it was driven out of that stream in 1798 by the erection of a sixteen-foot dam in Miller's River, 100 miles from the sea, which cut off the fish from their spawning beds. In 1872 there were twenty-eight rivers in the United States which once contained Salmon, but from twenty of them that fish has totally disappeared. To-day the nearest Atlantic Salmon are found in Maine and northern New Hampshire, New Brunswick and Nova Scotia.

As a game fish, *Salmo salar* is fit to rank with the kings of the animal world. He who catches one with a fifteen-foot rod weighing twenty ounces, with a Silver Doctor at the end of five-foot leader, and brings it to the gaff, may well call himself an angler. So far as I know, this is the largest fish that rises to a fly.

The greatest weight on record for the Atlantic Salmon is 83 pounds. The maximum weight of those now taken in Maine is about 25 pounds, and the average is about 10 pounds. In 1900, the catch of the Bangor anglers in Penobscot Pool was 67 fish, weighing 970 pounds. The largest weighed 23½ pounds, and the average was nearly 14½ pounds.

The most wonderful thing about the Atlantic Salmon is its leaping power, in surmounting waterfalls that lie in its course to its spawning grounds. To a fish of this species, a rock-studded cascade three hundred feet long and thirty feet high, down which the water plunges and tears with murderous speed and violence, is a fine highway, up which it gayly promenades without pause or accident.

But a waterfall, with a perpendicular drop of ten or twelve feet, is a more serious proposition, and requires a special effort. To clear such a barrier, the Salmon makes a rush in the pool below it, leaps out of the water, and if possible lands on the edge of the fall. If he falls short by no more than one or two feet, but strikes the descending torrent squarely head on, so that he is not at once swept down, it is said that by a strong flirt of the tail and a wriggle of the body, the gallant fish actually can force itself on up to the edge of the fall, and over it into the coveted waters of the upper level. Like many other things that are done by wild creatures, this final plunge upward through a waterfall seems incredible; but it is well attested.

The following graphic description of the leap of the Salmon is from the pen of Dr. Robert T. Morris, whose opportunities for observing and photographing the scenes he describes have been of the best:[2]

"It is a most impressive and inspiring sight to watch the untamed Salmon on a wild river mak-

[1] *Sal'mo sa'lar.*

[2] *Country Life* Magazine, 1903, p. 356.

ing his display of strength and agility in surmounting a crashing torrent that threatens with instant death anything that dares to approach its mad tumult of waters. A Salmon can make his way upward through a sheer fall of water so long as the water is in a solid mass, but the moment that it becomes admixed with air the white water no longer gives a sufficiently firm hold for the broad caudal fin, and the Salmon must leap entirely over the fall. There are pretty well authenticated instances of Salmon clearing a fall of twenty feet. I have measured leaps to nearly this length on falls where almost every Salmon that flew through the air over the fall fairly took one's breath away, and they were going up at the rate of three or four to the minute at that. I know of nothing short of watching a house on fire that is of more engaging interest than watching the Salmon throwing themselves over wicked waters. The Salmon must have some advantages, to be sure, for accomplishing their best feats. If the water beneath a fall is much broken with rocks and rapids a fish cannot gain sufficient momentum and velocity for hurling himself far into the air; but given a deep and fairly quiet pool to start from, and the Salmon look more like great birds than like fish as they sail upward. One can sometimes find a place to stand at the edge of a fall, and if he remain quiet for a few moments the Salmon will begin to go through the air over his head in quick succession."

Dr. Morris states that from the Penobscot River, in Maine, to Hudson Bay, Salmon enter almost every river on the coast, but south of the Straits of Belle Isle the sawdust and dams in the streams of the lumber region constitute most serious obstacles to their progress and existence. But "the time is coming when twenty rivers on the Maine coast will have their mills so managed in the interest of the Salmon that they will rival the historical streams of Europe. In Washington County alone there are six rivers that Salmon now ascend every year."

The Ouananiche,[1] whose name is of Indian origin, and is pronounced *win-nan-ish'*, is a fresh-water Salmon, dear to the heart of every angler who has ever brought one to gaff.

It is fondly spoken of as the "*Leaping Ouananiche,*" and frequently as the *Landlocked Salmon.* It is neither more nor less than a fierce-fighting, fresh-water understudy of the Atlantic salmon, which if not self-restricted to fresh water would hardly be described as an independent species. When first taken from the water, it has "a beautiful peacock-blue" color, which disappears at death, changing to the light-gray back and sides and silvery belly of the Salmon. Although called "landlocked," this fish can, and sometimes does, live in salt water, —in the mouth of the Saguenay River, for example.

The Ouananiche is a fish which loves rapids and rushing water as a mountain sheep loves crags and precipices. Because of the strenuous life it leads, it is beyond doubt the most vigorous and athletic fish that inhabits our waters.

Says Mr. Eugene McCarthy: "None of the fresh-water fish can equal its fighting powers, and, pound for pound, it will outfight even the salmon. Ouananiche are great smashers of rods and tackle, unless one understands how to play them, especially when they make their numerous high jumps from the water. It is not an exaggeration to state that these jumps will average at least five to six, and frequently will number ten to twelve feet. And such leaps! Two or three feet out of the water, often toward the fisherman, then a rush deep down, a pause, a succession of jerks that would seem to tear the hook loose, a wild rush of varying distance, and a run back, almost to the angler's feet. A fish weighing 3½ or 4 pounds will make a fight lasting ten or fifteen minutes, often longer; and that means hard work for every moment for the fisherman." ("Familiar Fish," p. 126.)

This fish is best taken with a fly, on a rod of from six to eight ounces, with No. 4 or 5 hooks. Its home is in Lake St. John, Province of Quebec, and its tributaries; its outlet, the Saguenay, and no one knows how many of the rivers of southern Quebec that flow into the Gulf of St. Lawrence; and also the rivers of Labrador.

The Sebago Salmon,[2] of Maine, is a strictly fresh-water, or "landlocked," species, which takes its name from Sebago Lake, its type locality. It is essentially a 15-pound fish, with an average in Sebago Lake of from 8 to 10 pounds. Owing to the quiet waters it inhabits, and the powerful tackle used in fishing for it, this fish does not manifest the vigor and fighting quali-

[1] *Sal'mo ouan-an-iche'.*

[2] *Sal'mo se-ba'yo.*

ties that have made the ouananiche famous. This species bears to Atlantic salmon and the ouananiche so close a resemblance that it is yet an open question whether the three species should not be merged into one (*Salmo salar*). At all events, a picture of the Sebago Salmon might easily, under other names, be made to do duty in representing the other two!

The Tarpon[1] is one of the very few large fishes to which it is proper to apply the word *magnificent*. Either in the water or out, or hanging upon the wall of a dining-room, it is as its pet name implies, a Silver King, entitled to royal honors. Its enormous scales, its back of royal blue and sides of burnished silver proclaim it at a glance, and in the presence of such external splendor we cease to care whether its flesh is savory or not. How the Romans would have doted upon this fish, had they but lived within its realm!

To-day it is beloved of every American sportsman who can get in touch with it, first because of its imposing personality, and next because of the difficulty in catching it with hook and line. It is taken by rod-and-reel fishing in lagoons, and also by trolling in "the passes" between islands. Its flesh is excellent, and will always hold its place in the markets of the South.

In cruising around the coast of Florida, you first see the Tarpon breaking water, back in air, like an undulating porpoise. You may see fifty of them, and sail and fish for days before you catch one; but one big Silver King pays for a long journey, and ten days of cruising.

Twenty-five years ago, no one attempted to catch a 100-pound Tarpon with rod, reel and line of light weight. To-day, angling for this grand creature has become an established recreation, and on the Florida coast is regularly pursued as such at Fort Myers, Punta Rassa, Boca Grande Pass, Marco, and Bahia Honda, on the adjacent coast of Cuba. Besides the above, Corpus Christi, Texas, and Tampico, Mexico, have become famous as resorts for Tarpon fishermen.

Drawn by J. Carter Beard.

THE TARPON.

The size of this fish is entirely satisfactory. Usually its weight is between 100 and 200 pounds, but it is credited with a maximum record of 383. Specimens six feet long are by no means rare.

So far as known on August 1, 1927, the championship of Tarpon angling was then held by Mr. Edward vom Hofe of New York, with a fish of 210 pounds weight, a length of 6 feet 11 inches, and a girth measurement of 45 inches. Its larg-

[1] *Tar'pon at-lan'ti-cus.*

est scales measured 3⅞ × 4 inches. The tackle used in the capture of this fish consisted of a short-butt snakewood rod seven feet long, of which the tip weighed thirteen ounces, a vom Hofe Universal reel, 600 feet of No. 24 vom Hofe line, and a No. 1 Van Vleck hook.

The Tarpon is not to be caught in deep water with hook and line. As a rule, the waters of the east coast of Florida are unsuitable for successful adventures with the Silver King; but at several points on the west coast, where the level beach of clear sand shelves far out into the Gulf before it drops into deep water, this grand fish loves to bask in the sunshine, and linger in the warm, placid waters along the shore.

In a few localities, Tarpon are really plentiful, and easily caught. Off Useppa Island, Florida, between March 5 and May 31, 1903, the total catch of Tarpon was 336.

The Common Shad[1] is, to many persons, the most savory of all American fishes. It possesses the maximum number of bones to the cubic inch, but its flesh is fine-grained, juicy, and of exquisite flavor. The freshest Shad is "the finest Shad," but when treated with even a show of culinary fairness, every fresh Shad is good.

Like the salmon, the Shad spends half its life in the sea, and enters the rivers of its choice only to spawn. Owing to the practical impossibility of taking Shad in the ocean, the shad-fishing season is limited to its spawning-season. This is one of the most prolific of our fishes, a single fish sometimes yielding 150,000 eggs. It is easily propagated by artificial means, and a decrease in the annual supply can in a measure be made good by the hatcheries of the United States Bureau of Fisheries. During the spring of 1926 the Agents of that Bureau planted 9,143,800 young Shad and eggs in the rivers of the Atlantic coast that are accepted by the species as breeding-grounds.

This fish is found all along our Atlantic coast from Florida to Newfoundland, but it is most abundant from the Hudson River to the Potomac.

It is no cause for surprise that the catching of Shad in the spawning season and the amazing but destructive exploitation of the delectable "shad-roe" morsel now has developed a shad-protection problem of the first magnitude, and efforts to prevent shad extermination now are thoroughly in order.

Says Mr. Glen C. Leach, of the United States Bureau of Fisheries (Report for 1926):

"The *degree of success attained in shad propagation at eastern stations of the bureau has not been encouraging.* The practicability of rearing shad in ponds of 100 to 500 acres in area should be determined. It is quite apparent that if the supply of this valuable fish is to be maintained in Atlantic coastal streams scientific investigations should be made to determine what regulations are necessary. In the meantime it is suggested that an annual closed season that will

THE COMMON SHAD.

shorten fishing operations be provided. In addition, a weekly closed period extending from sundown Friday to sunrise Monday should be adopted and the number of nets should be curtailed and the distance between them increased."

In 1925 one year's catch of Shad, throughout all the waters of the United States, was 16,968,790, against 49,780,530 pounds in 1899! The value in 1925 was $2,489,928, against $1,519,916 in 1899, showing the enormous increase in price to the consumers.

Originally, the Shad was not a habitant of Pacific waters; but in 1871, Mr. Seth Green, of Rochester, made for the California State Fish Commission the initial experiment of transporting 10,000 young Shad across the continent, and planting them in the Sacramento River. From that year up to 1880, about 60,000 more fry were

[1] *Al-o'sa sap-i-dis'si-na.*

deposited in that stream by the United States Bureau of Fisheries. In 1885 and 1886, 910,000 Shad fry were planted in the Columbia and Willamette Rivers.

To-day, on the Pacific coast the Shad ranges from southern California to southern Alaska, and is one of the most valuable food fishes of that region. In 1899, the fish dealers of California alone handled 1,137,801 pounds, worth $14,303.

The average length of the Shad is from 24 to 30 inches, and its weight is from 3 to 4 pounds. The color of the fish is a soft, silvery white, all over, but the scales are easily detached, and an immaculate specimen is rarely seen in a fish market.

To landlocked Americans of the upper Mississippi valley and the shores of the Great Lakes, the **Common Whitefish**[1] is an undisguised blessing. To them it is all that the shad is to the East, or the salmon to the Pacific coast. Whenever the traveller between Cleveland and Omaha discovers before him a large fish of excellent flavor, he may be sure that it is either a Whitefish or a lake trout, from one of the great lakes, and worthy of profound respect.

But for the fact that this fish is so well and so widely known, many pages might be written of it without exhausting the subject. Dr. Jordan considers the Whitefishes the most important group of fresh-water fishes of North America, and probably of the world.

The home of this group extends from Niagara to Chicago and Duluth. The average weight of a typical fish is about 4 pounds, but specimens weighing 20 pounds have been taken. In 1922 the catch of Whitefish (all species) amounted to 4,567,901 pounds, worth $718,359. In 1898 the catch in Canadian waters, say Jordan and Evermann, amounted to about 18 million pounds, worth $877,000.

In winter, the Whitefish retires to the deepest portions of the great lakes, and is beyond the reach of fishermen. In the spring, it frequents the shallower waters, near shore, where it spawns, and lingers to fall a prey to the gill-net fishermen, even until late in the autumn.

[1] *Co-re-go'nus clu-pe-i-for'mis.*

CHAPTER XLVIII

THE ORDER OF FLYING-FISHES

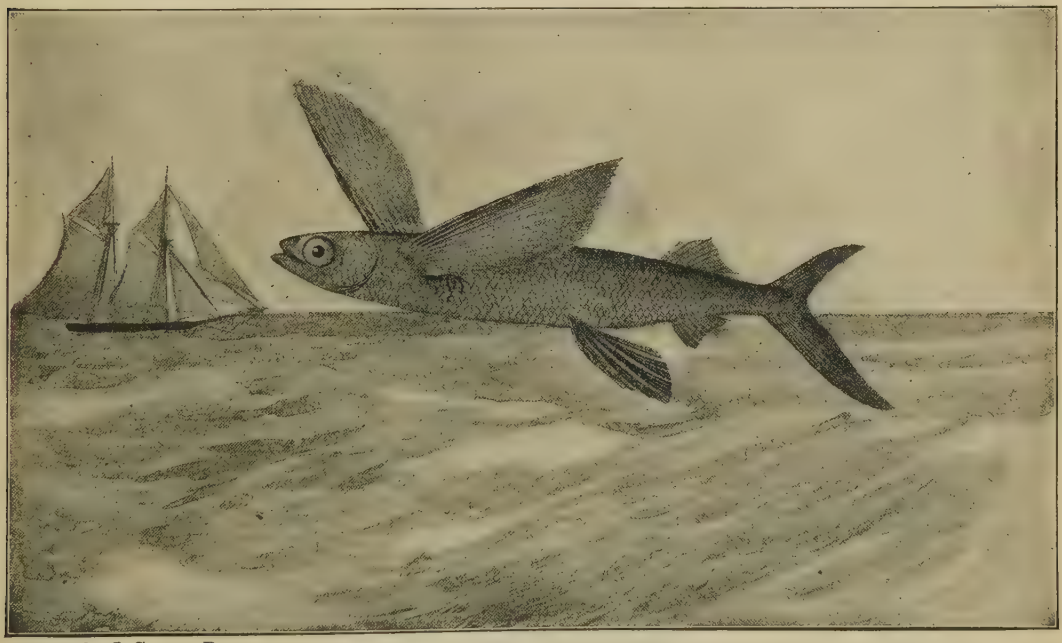
SYNENTOGNATHI

The Common Flying-Fish[1] is as necessary to a perfect ocean voyage as a whale and a school of "dolphins." Suddenly and unexpectedly it breaks out of the side of a wave, and with a tremulous flutter of wing-like pectoral fins,—that from the ship's forecastle seem to be ultramarine blue,—it feebly guides its course away from the disturbing mountain of throbbing steel. The flight of a Flying-Fish is usually from four to six feet above the water, and is sustained for from 50 to 100 feet. The greatly enlarged pectoral fins act as wings, and furnish the motive power.

Someone has raised the question, "Does a Flying-Fish move its wings in flight?" Of course it does. On all up grades it gives a stiff wing-stroke about every three feet, rises to overtop each advancing wave, and drops as the wave rolls on, like a stormy petrel.

This is distinctly a mid-ocean fish, but it swims in schools so near to the island of Barbadoes that the fishermen capture it in great quantities, for the markets. It is not unusual to see 2,000 in the market at one time. I have heard much of the pursuit of the Flying-Fish by the "dolphin" (*Coryphæna hippurus*), but have seen nothing of it.

The Flying Gurnard or **Sea Robin** (*Dac-ty-lop'ter-us vol'i-tans*), is a wonderful pink fish, 8 inches long, that is found from Cape Cod to Brazil. It is often picked up on the sea-shore near pound-nets, because fishermen throw it away as unmarketable; but as fish become more scarce, *it will be eaten.* Its pectoral fins are of enormous size, but useless for flight. This fish is *not* closely related to the flying-fish, but belongs in the Order of Spiny-Finned Fishes. It is the only representative of its Family in the New World, and only one other species exists elsewhere.



Drawn by J. Carter Beard. THE COMMON FLYING-FISH.

[1] *Ex-o-cae'tus vol'i-tans.*

CHAPTER XLIX

THE ORDER OF SOLID-JAW FISHES

PLECTOGNATHI

The characters on which the members of this Order have been brought together are, for the general reader, rather obscure. They are strictly anatomical, and relate to the manner in which the teeth and bones of the jaw are grown together, and solidified. On the whole, it will be about as easy to become acquainted with the various groups of fishes composing the Order as to learn fully and correctly the precise anatomical characters which are common to all.

This Order contains some very odd and picturesque forms; and, fortunately for the student, good examples of them are fairly common along the Atlantic coast.

The Trigger-Fish,[1] or **File-Fish,** is a very good species to represent this entire group. It derives one of its names from the large, movable spine of solid bone (a fin-ray of the front dorsal fin), which stands upon the foremost point of its back, with a smaller trigger behind it, like that upon an old-fashioned hair-trigger rifle. The large spine can be set quite rigidly by a neat interlocking device supplied by the second spine.

This fish is a thin-bodied creature, and its skin has the toughness, the rigidity and even the external appearance of stamped leather, with the roughness of fine sand-paper. It is a fine fish for the first efforts of the amateur taxidermist, for it has ingrowing scales that cannot possibly come off, and its colors are equally fast.

All the Trigger-Fishes are habitants of tropical and subtropical waters, and feed chiefly upon small shell-fishes (mollusks) which their strong jaws and teeth enable them to masticate successfully. Some of them, like the *Orange File-Fish,* are brilliantly colored. In the tropics they are considered edible, but the few that exist along our Atlantic coast are not ranked as food fishes. The species shown in the illustration is the one most widely known along our Gulf coast, and also the Atlantic coast up to the mouth of the Potomac. In the Bahamas and the Bermudas, the skins of Trigger-Fishes are extensively used by carpenters in place of sand-paper for smoothing the surface of wood previous to polishing.

The Box-Fish, or **Trunk-Fish,**[2] is one of the curiosities of the tropic seas, and of curio-shops generally. Its skin is a rigid, triangular box, shaped in cross-section like an isosceles triangle, and consists of large hexagonal plates of thin bone, joined firmly together by the regular integument.

Of these fishes we have four species on our Atlantic and Gulf coasts, and one off California. According to Dr. G. Brown Goode, all the species of Box-Fishes were so thoroughly and correctly studied by the fathers of natural history two hundred years ago, that their classification of the group has stood the test of time, and come down even into these troublous times unchanged and unimproved.

The Bellows-Fish,[3] or **Rabbit-Fish,** is possessed of many local names, such as *Globe, Bottle, Blower,* and even *Egg Fish.* When taken from the water, and scratched smartly on the abdomen against the grain of the small spines which cover that region, it begins to pump air into its interior, the skin expands like india-rubber, and in a moment it assumes balloon-like proportions. If the fish is then thrown into the water, it floats belly upward for a moment, then suddenly the air is expelled, the fish collapses, instantly turns right side up, and disappears.

This species ranges from Cape Cod to the Gulf of Mexico, and may be looked for with confidence in the pound-nets at nearly all our seaside resorts.

[1] *Ba-lis'tes ca-pris'cus.* See figure on page 374.

[2] *Os-trac'i-on quad-ri-cor'nis.* See illustration on page 374.

[3] *Lag-o-ceph'a-lus lae-vi-ga'tus.*

The Porcupine Fish,[1] also known as *Puffer, Ball-Fish, Swell-Fish* and *Toad-Fish*, is another sea-side "curio," although usually it is stuffed not wisely, but too swell. A tow-filled balloon of fish-skin, with spines upon it, is not necessarily a Porcupine Fish; and the sea-side taxidermist should sometimes put a curb upon his zeal for expansion.

Like the bellows-fish, this species can expand itself with air to about twice its normal size. Its back is covered with strong, bony spines, which in some species are an inch in length. It is a fish of tropical waters, and in Cuba is considered a food fish. The species figured is one of four which in summer visit our Atlantic coast, while two others are found on the coast of California

[1] *Chi-lo-myc'te-rus ge-o-met'ri-cus.* See illustration on page 374.

CHAPTER L

THE ORDER OF SUCKERS, CARP, AND MINNOWS

PLECTOSPONDYLI

THE SUCKER FAMILY.

Cat-os-tom'i-dae.

This huge Order contains 60 genera and 311 species, divided into 4 Families. Of these Families, the Sucker Family is the most important. It contains about 70 species, all of which save two are habitants of North America. Besides the Suckers themselves the Family includes the buffalo fish, the red-horse and fresh-water "mullet." These fishes have the mouth placed underneath the head, and fitted with very fleshy, tubular lips, well adapted for sucking food from the bottom. They have been specially formed to live upon mud bottoms, and in murky water,—

THE COMMON SUCKER.

precisely the conditions that high-class fishes abhor.

There are times when a sucker (or a carp) seems like a good fish for the table; and that is when one is very fish-hungry, and there is no other kind of fish to be had. To my mind, the flavor of the flesh is either barely tolerable, or verging closely upon disagreeable. The very numerous and wholly unnecessary bones seem like a positive affront. Although these fishes are seldom eaten by choice, by the landlocked dwellers in the interior of our great continent, to whom clear streams and good fishes are only long-distance memories, the sucker, carp and bull-head are eaten with real relish, and a feeling of thankfulness that they are no worse. And after all, men who can eat musky squirrels, and call them "game," ought to be pleased with suckers and carp.

The Common Sucker,[1] **Brook, or White Sucker,** is qualified to represent a large section of this Family. In the home of this fish, acquaintance with it nearly always begins in the month of June, when, if ever, come perfect days, and the annual spring "run" of Suckers, up river and creek to their spawning beds, brings them prominently into notice.

I remember one wildly hilarious day of boyhood, when a great run of Suckers came up Eagle Creek, Indiana, from the Ohio, via White River.

Now Eagle Creek is a very beautiful stream, flowing over a fine bed of clear gravel and sand. Its waters are as clear as the sea, and the big sycamores that reach their long white arms across them are truly grand. All the young men and small boys turned out *en masse*, and rushed to a shallow, rock-bound channel above a big "drift." Each able-bodied "angler" was armed with a snare of soft brass wire loaded with enough lead to kill an elephant, and a pole that would have driven a real angler to a mad-house.

The Suckers moved about restlessly in the swift current, and occasionally paused, head up-stream. That was the snarer's only opportunity; for the fish refused all baits. The heavily loaded snare was set as a hoop five inches in diameter, gently lowered ahead of the fish, and with a very steady hand and correct eye steered downward over the victim until it passed his pectoral fins. Then, at precisely the proper instant, steam was turned on, the erstwhile quiet fisherman became a raging demon of activity, and if the snare held just "so," a 16-inch Sucker weighing 4 pounds would be yanked high in air by a human derrick, amid the shouts of a de-

[1] *Ca-tos'to-mus com'mer-son-i.*

lighted and strong-lunged populace. The string of fish caught on that halcyon day by my tall brother reached from my shoulders to the ground, and for three days the cooks of that countryside had Suckers "to burn."

This Sucker is perhaps the most widely distributed and the most common fish species inhabiting the United States. It ranges "from Quebec and Massachusetts westward to Montana and Colorado, and southward to Missouri and Georgia." (Jordan.) It is one of the best of its Family for the table, it is universally eaten, and is much superior to any carp the writer has ever encountered. In one year (1899–1900) the catch of Suckers in twenty-three states yielded 655,637 pounds, worth $115,512.

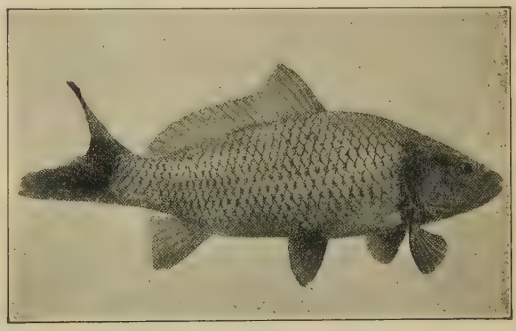
The Red-Horse,[1] or so-called "Mullet," which makes Ohio the centre of its distribution, is an abundant and well-known fish in the region west of the Alleghenies. It is rather handsome in ever encountered. In the year 1922 the total catch of Suckers in the United States was 6,675,-837 pounds, worth $376,173.

The Buffalo Fishes[2] comprise three species, all big and burly, ranging in maximum weight from 35 to 50 pounds, and from 2 to 3½ feet in length. They inhabit the Mississippi and its tributaries, and in the spawning season push their way even into the larger lakes and flooded marshes of Wisconsin, Iowa and Minnesota. I have seen specimens weighing between 30 and 40 pounds caught in the Mississippi, at Burlington, Iowa, by hand-line fishing between lumber rafts, with about as much interest and enthusiasm on the part of the fisherman as usually attends the capture of a good strawberry bass. One fat and fearless "angler" sat on a chair, and baited his hook with cheese.

But let no one underrate the economic importance of the Buffalo Fish. The catch of 1922, in the Mississippi River and its tributaries, amounted to 17,267,532 pounds, valued at $1,013,757.

The German Carp[3] was introduced into the United States by Mr. R. Poppe in 1872, and in 1877 by the United States Bureau of Fisheries, because of the fact that in Germany it is considered a good food fish, and can live and thrive in muddy ponds and streams. By thousands of prairie dwellers, it was received gladly, especially throughout the great plains, where any fish with scales is welcomed. The free distribution of young Carp led a great many persons to apply for them, and plant them in ponds, from which they afterward found their way into streams that contained fishes infinitely their superior.

Between the years 1877 and 1885, the streams of very nearly the whole Pacific coast of the United States were stocked with Carp. At first



GERMAN SCALED CARP.

they were placed in ponds, but through "moving accident, by flood and field," they reached the rivers, and impregnated them and all their tributaries. At first they were highly esteemed, and sometimes greatly overpraised. It was claimed that they were hardy, prolific, harmless to other fishes, rapid in growth, persistent under adverse conditions, and acceptable on the table. Beyond question, *under certain conditions* nearly all these claims are justified by the facts!

But when the novelty wore off the Carp, the cold-blooded critic began to say things. By him it was pointed out that Carp stir up the mud in all mud-bottomed ponds inhabited by them, and keep the water murky. This is quite true; and to keep the mud-loving Carp from perpetually soiling and disfiguring the once clear and beautiful waters of the Merced Lakes, in California, first sea-lions, and then muskallunge, were introduced to exterminate the Carp.

In California, the Carp is now ranked with the introduced catfish, as an unwelcome guest. It is claimed that Carp consume to a serious extent the wild celery and grasses on which wild ducks feed, and the duck supply is diminished

[1] *Mox-os-to'ma au-re-o'lum.*
[2] The Common Buffalo Fish is *Ic-ti'o-bus cyp-ri-nel'la.*
[3] *Cy-pri'nus car'pi-o.*

thereby; but this charge remains to be proven. The chances are as ninety-nine to one that the choke-bore shot-gun is the most far-reaching cause of the decrease in wild ducks.

It is also claimed that Carp eat the eggs of other fishes; which is extremely probable, for very many fishes do that.

Whatever may be said for or against the desirability of the Carp in America, one important fact remains unassailed. That fish is now thoroughly established in our waters, and is here to stay, just as much as the English sparrow. It is permanently in demand as a market fish.

The Great Lakes region consumed in 1922 eight million pounds, and the Mississippi River and its tributaries yielded in the same year 18,338,371 pounds. The annual yield of the Carp industry may be set down (1922) at 28,620,834 pounds, worth $1,406,384.

Minnows.—No common fishes of our country, it is safe to say, are so little understood, or so generally misunderstood, as those classed under the above name. To most persons a "Minnow" is a tiny young fish, from one to three inches in length, useful only as bait for bass and other fishes.

The Minnow Family contains (says "American Food and Game Fishes") 200 genera, and more than 1,000 species, of which about 225 are found in our waters.

Many a Minnow only two inches in length is a fully grown fish; but some species of Minnows attain a length of from one to two feet. One of the Pacific coast species (the Squaw-Fish) sometimes reaches a length of 4 feet.

For obvious reasons, it is impracticable to attempt to set forth even the leading species of this extensive Family, but it is proper to mention that to it belong the *Hornyhead,* of the Ohio and Mississippi valleys, the *Fallfish* of the northern Atlantic states, the *Common Chub* of the northeastern states, the *Columbia Chub* of the far northwestern states, and the *Utah Lake Chub* of Utah and northwestern Wyoming.

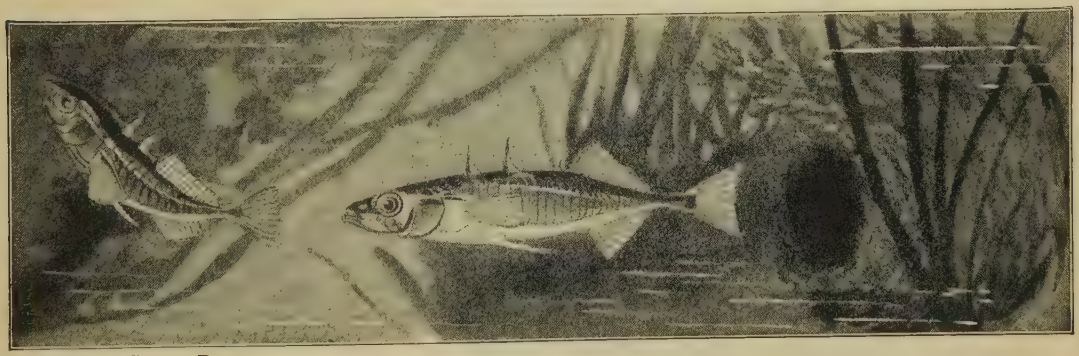
CHAPTER LI

THE ORDER OF HALF-GILLED FISHES

HEMIBRANCHII

Because of the fact that a few very small fishes have less than their rightful number of gill-arches, and shoulder-girdles with one bone only instead of two, the Order of Half-Gilled Fishes has been created.

The Sticklebacks are very small fishes, only a few inches in length, and derive their name from the formidable dorsal spines that stand upon the back in front of the dorsal fin. We have Two-Spined, Four-Spined and Ten-Spined Sticklebacks, all three being found in brackish water along the Atlantic coast from Cape Ann to New Jersey.



Drawn by J. Carter Beard.

TWO-SPINED STICKLEBACK.

All the Sticklebacks are celebrated for their nest-building habits. The abdomen of the male fish has been provided with a large gland which is "filled with a clear secretion which coagulates into threads" when it comes in contact with water. At first the fluid is colorless, but after contact with water it becomes whitish, and its many fibres hang together like strings of spaghetti. (Ryder.)

The entire work of nest-building is performed by the male Stickleback. It begins by selecting a bottom situation, in a gentle current, wherein the nest can be attached to two or more stems of growing vegetation, and anchored fast. Some observers say that the fish first brings a few stems and bits of vegetation, and by means of his gelatinous secretion practically ties them fast to the upright stalks, to use as a foundation.

The fish then proceeds to exude its secretion and dispose it in commingling rings, vertically, around a space sufficiently large for the female Stickleback to pass through. In a manner nothing short of marvellous, a hood-like nest is spun, of the fish's own secretion, which well retains its shape for some weeks. In this the female deposits her eggs, all the time jealously watched by the male, to prevent her from eating them! The male guards the eggs until they are hatched, and it is said that if the current flowing through the nest does not meet his views as to strength, the fish increases the volume of it by moving its pectoral fins to and fro. Sticklebacks are sometimes kept in aquaria in order that they may show their wonderful intelligence in nest-building.

The Two-Spined Stickleback[1] will serve as a type for the whole Order. It is only about 7 inches long, and has no commercial value. It is said to occur in quiet brackish waters along our coast, but is seldom brought into notice outside of aquaria.

[1] *Gas-ter-os'te-us a-cu-le-a'tus.*

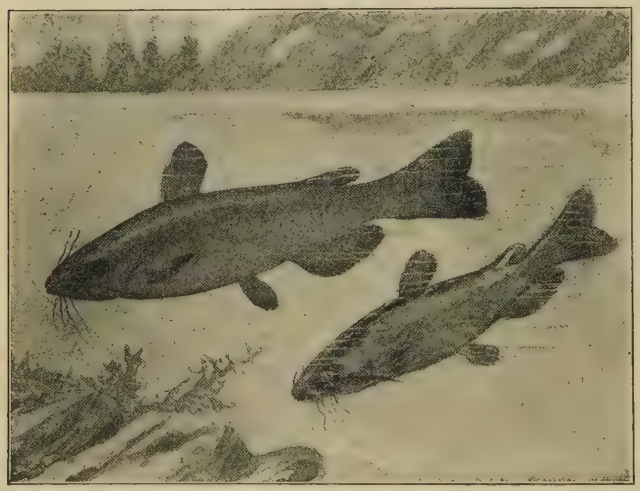
CHAPTER LII

THE ORDER OF CATFISHES

NEMATOGNATHI

Acquaintance with this numerous Family usually begins with the bullhead, which is merely a pygmy catfish.

Even when a lad in prairie-land, thirsting for open water and aquatics, and looking upon every mile of running water as an enchanted realm, the bullhead did not appeal to me as a genuine fish. Even when most eager to "quit, and go a-fishing, and call it half a day," we drew the line at that ill-shaped, skinny body, ugly head and wide-gaping mouth with barbels that suggest dripping saliva. To me it was, and still is, a repulsive creature, and its only feature worthy of respect is the outfit of sharp and dangerous spines with which its dorsal and pectoral fins are furnished.



Drawn by J. Carter Beard.

COMMON BULLHEAD.

Excepting the big Mississippi catfish, it is the most unattractive fish inhabiting our fresh waters, and as an angler's proposition, it is worse than an eel. It is easily taken on a trot-line; and the "trot-line," set for all night across a stream, and hung with about twenty short lines and hooks, represents the lowest depths of depravity in fishing with hook and line. It is even lower than fishing with four poles.

With a tenacity of purpose worthy of a better species, the bullhead ramifies throughout the muddiest rivers and creeks of the United States, and in the heat of midsummer holds on whence all but him have fled. He was built for mud bottoms and murky waters, and so long as the mud is thin enough to swim in, and deep enough to float him, he remains. When removed from his native element, the tenacity of life of this creature is astonishing. A bullhead will lie on the bank in midsummer sunshine, and breathe hot air for an hour without giving up.

The species of catfishes found in the United States number about thirty, but it is recorded that elsewhere there are about 970 more, representing in all about 100 genera. Of our series, all save four are confined to the eastern half of the United States.

The Mississippi Catfish,[1] or **Blue Cat,** of the Mississippi River and Gulf States is the giant of its genus. Even when alive and in good health, it is a very ugly fish,—heavy-paunched and mud-colored. It looks like a fish modelled out of river-mud. I saw a specimen taken at Burlington, Iowa, which weighed 93 pounds, and have heard of others exceeding 100 pounds. Jordan and Evermann say the "record specimen weighed 150 pounds," and was caught at St. Louis; but the mischievous evenness of the figure casts doubt upon the reliability of the record.

Very naturally, the tons of edible flesh annually contributed by this fish to our national food supply are not wasted. Thousands of persons

[1] *Ic-tu-lu'rus fur-ca'tus.*

like the flesh of Catfish and bullheads, and in a period of twelve months about 1925 the fresh waters of the United States yielded 13,061,059 pounds, worth $1,043,581. Even the Pacific coast states consumed 336,279 pounds, worth $54,942.

The Channel Catfish[1] is the large Catfish of the North, and also the Mississippi valley, which so closely resembles the preceding species that it is at best very difficult—and sometimes impossible—to distinguish them. It is, however, much smaller than the blue cat, and instead of frequenting sluggish waters, it displays a decided preference for river channels, and clear water when it can be found. Naturally enough, its flesh is said to be of better flavor than the more sluggish, mud-inhabiting blue cat.

The Common Bullhead,[2] or **Horned Pout,** is merely a small, cheap catfish, whose room is better than his company. It ranges from the Atlantic well into the eastern edge of the great plains, and from the great lakes to the Gulf.

[1] *Ic-tu-lu'rus punc-ta'tus.*
[2] *Amei'u—rus neb-u-lo'sus.*

Much to the displeasure of many persons in California, three species of catfish have been introduced into many streams on the Pacific coast. Concerning them, the San Francisco *Evening Bulletin* has thus recorded the facts, and its views thereon:

"Then the fish commissioners made another unfortunate experiment, against the strongest protests that could be put forth. They introduced the hated and almost worthless Catfish to the waters of California. These fish, like the carp, have multiplied rapidly. It was reported, in answer to protests made at the time, that only a superior kind of Catfish would be introduced, against which there could be no objection. But they turned out to be the same old toughs that have occupied western rivers and bayous to the exclusion of better fish. These Catfish are voracious feeders on young trout and salmon. Their value is so low that very few seek them. The Chinese sell them occasionally, as they do carp, if they can find a customer. But most consumers turn away from these fish in disgust."

CHAPTER LIII

THE ORDER OF FLAT-FISHES

HETEROSOMATA

The flounders, halibuts, soles, plaice, and turbots make up the very desirable and important Order of Flat-Fishes. When in doubt about an English or continental breakfast, order a fried sole and you are safe; for so trustworthy is this fish that only the most bungling cook can spoil it. In England, the sole is almost a national institution, but on our side, its counterpart, the small flounder, is not so plentiful that it attains equal importance on the daily bill of fare.

The Order of Flat-Fishes, all the world over, is very large, "containing about fifty-five genera and nearly five hundred species." Among its members, some of the halibuts attain great size. Almost any member of this Order is recognizable at one glance, by its broad, oval form, almost completely encircled by the fringe-like dorsal and anal fins, and the presence of both eyes on the upper side of the body. The body is so thin that "flat as a flounder" is a standard comparison wherever the English language is spoken.

THE COMMON HALIBUT.

The Flat-Fishes are good examples of protective coloring. All these fishes swim and rest with their bodies in a horizontal position. The upper surface, or back, is always darkest, and in many instances it is so skilfully colored and mottled in imitation of the sandy bottom on which it lives, that when at rest on the floor of the ocean or aquarium the fish is almost invisible. On the other hand, the under side of the fish is white, or cream color, in order that to enemies below it, looking upward, it will match the light of the upper world.

As food fishes, the majority of the Flat-Fishes are very desirable. Their flesh is excellent, and their bones are few and far between. The flesh of the halibut is very white and firm, and whether fresh or smoked, it is highly palatable.

The common flounders are so well known they require no special notice. The species most common on our coast is the **Winter Flounder,**[1] which is caught in great numbers, and of all our Flat-Fishes is next in value to the great halibut. It is a small species, with an average weight of about 3 pounds, and a maximum of 5 pounds, or thereabouts. It has been extensively propagated by the United States Bureau of Fisheries.

The Common Halibut[2] is a cold-water fish of commanding importance. It is widely dispersed throughout both the North Atlantic, North Pacific and circumpolar waters, not only in shallow waters and the off-shore banks, but also on the sides of the sea-bottom slopes down to 1,500 feet. In the Atlantic, fishermen say the species stops at the latitude of the Delaware River. The fisheries along the west coast of Greenland are so important that regularly every year a number of schooners from Connecticut and Massachusetts go north, sometimes beyond the

[1] *Pseu'do-pleu'ro-nec'tes americanus.*
[2] *Hip-po-glos'sus hip-po-glos'sus.*

Arctic Circle, and return loaded with Halibut to within three feet of their deck-beams.

On the Pacific coast, according to Dr. T. H. Bean, the Common Halibut ranges from the Farallone Islands, opposite San Francisco, to Bering Strait, its centre of abundance being found in the Gulf of Alaska, near Kodiak.

In point of size this fish is surpassed in our waters by no other good food fish, the 500-pound jewfishes being out of that class. A large Halibut is one which weighs 250 pounds or more. The largest of reliable record (at least from our waters) was observed by Captain Atwood, at Provincetown, Massachusetts. It weighed 401 pounds gross (we are thankful for that odd one pound!) and 322 pounds dressed. Dr. G. Brown Goode states that a Halibut weighing 350 pounds is from 7 to 8 feet long, by nearly 4 feet wide.

The roe of a fish weighing nearly 200 pounds, which was caught at a depth of 200 fathoms, in water only 4° above freezing point, weighed 17 pounds, 2 ounces. A careful calculation made at the laboratory of the United States Bureau of Fisheries showed that the number of eggs in the mass was about 2,182,773.

The Halibut catch in twelve months of 1925 amounted to a total of 39,746,446 pounds, having a market value of $4,588,604, and all credited to Maine, Massachusetts, Washington and Oregon.

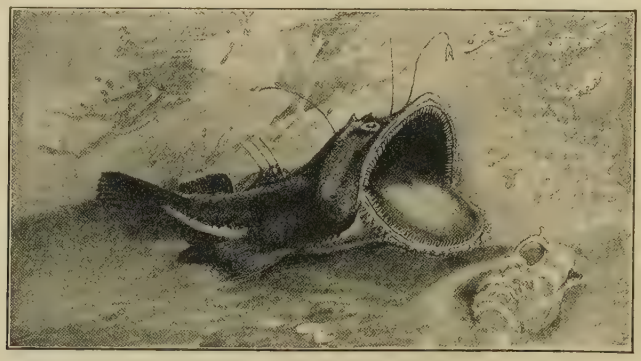
CHAPTER LIV

THE ORDER OF FOOT-FISHES

PEDICULATI

The strange creatures which form the group of so-called foot-fishes are introduced here, not in the expectation of close acquaintance with many of them, but rather that they may not remain absolute strangers to us. They live on the bottom of the sea, are not edible, and, being devoid of all value to mankind, they are safe from extermination. The most of them are also safe from close observation. Structurally, they stand next to the foot of the Subclass of Bony Fishes.

The Angler, or **Goose-Fish,**[1] is the typical representative of this Order. Among fishermen, it is sufficiently known that it has received twenty-one English names, and in the languages of continental Europe about fifty more. (G. Brown Goode.)



THE ANGLER.

It is the glutton of the sea, and its body is merely a purse-like attachment to a mouth that is fearful and wonderful to behold. It has a mouth and an appetite like an old-fashioned carpet-bag, and to it no living thing comes amiss. At present the body of this creature is painfully small for a mouth so ambitious and all-absorbing, but evolution is doing its perfect work, and eventually the maw of the Angler will be developed on the same scale as its mouth.

By taste and habit the Angler is in the same class as the human fish-hog who fishes with three poles at once. He lies on the bottom of the sea, where the muddy mottlings of his skin give him the appearance of mud and sand, opens his head widely, and props it open, for the free admission of any fish, crustacean, reptile or aquatic bird that chooses to enter.

Dr. Goode observes that the Goose-Fish derived that name from the swallowing of live geese, and that there is an authentic record of the capture of one which contained seven wild ducks.

A fully-grown Angler is about four feet long, and its mouth is a little more than a foot wide. From snout to tail its lower jaw and the median line of the body are fringed with tiny barbels most cunningly calculated to lure unsuspecting fishes within seizing distance.

The weight of a large specimen is from 35 to 40 pounds. In our longitudes it is used only for bait, but Dr. Goode says that "in Italy it is much esteemed as an article of food." No doubt of it. In Naples, they eat stewed octopus; which I can testify is as tender and palatable as rubber hose stewed in brine, but not any more so.

[1] *Loph'i-us pis-ca-to'ri-us.*

CHAPTER LV

THE ORDER OF EELS

APODES

Whenever a fish-like creature looks so much like a snake that it becomes necessary to inform people "it is not a snake, but a fish," then it is time to place it and all such creatures at the foot of the class of Bony Fishes. But for the good, hard bones in its skeleton, its descent to a position below the Order of Rays would be swift and sure.

As a real fish, an eel is little more than a caricature, and he who eats it must first skin it, just as the Dyaks of Borneo do their water-snakes before they roast them. It is the vulture of the waters, and prefers to feed upon things dead.

But, again are we reminded that there is no accounting for differences in taste. Both in Europe and America, they have been eaten ever since the days of the Cave-Dweller and Mound-Builder. And even to-day they are devoured, not with toleration, but with a degree of avidity worthy of better meat.

A German writer who catalogued the good points of the eel set forth prominently the fact that it is an excellent scavenger, and devours dead fish, crabs, and any fleshy prey, living or dead, that it can secure. Those who wish to pursue the subject of the food-habits of the eel to its logical conclusion can find it in a notable epic by Canon Ingoldsby, entitled "The Knight and the Lady."

Nevertheless, in times past, the eel has contributed a great store of edible flesh to the people of New England,—where some of the finest of fishes have always been abundant! There, eels are eaten—stewed, fried, pickled and salted. The flavor of an eel is not half bad, but its choice of food is decidedly objectionable. If eels are to be eaten by civilized people, then why draw the line at sharks, whose flesh is far superior to that of eels?

The United States Bureau of Fisheries has taken the eel quite seriously, and been at considerable pains to introduce it in the upper Mississippi valley, the great lakes above Niagara Falls, and on the Pacific coast. And yet, Professor Baird recorded this very pertinent statement:

"It [the eel] is, however, a very undesirable inmate of rivers in which fish are taken by means of gill-nets, the destruction of shad and herring in the waters of the Susquehanna and others farther south being enormous. *It is not unfrequent that, when a gill-net is hauled up, the greater part of the catch consists simply of heads and back-bones, the remainder being devoured by myriads of eels in the short time the net is left out.*"

THE ELECTRIC EEL.

Is such a rapacious scavenger as this a species worthy of introduction in any new waters save those of an avowed enemy?

The maximum length of the **Common Eel**[1] is about four feet, but the average length is less than three feet. The female lays an enormous number of eggs,—estimated at ten millions,—preferably in salt water; but the young enter fresh water to develop, and ascend as far as they can go.

The Electric Eel[2] of South America is an Eel worth knowing. Having had with it some thrilling experiences, I can speak of it feelingly.

Once while canoeing for zoological specimens

[1] *An-gu-il'la vul-gar'is.*
[2] *Gym-no'tus e-lec'tri-cus.*

in the delta of the Orinoco, we entered a large creek flowing into the main stream from the south, and ascended it to the head of canoe navigation. It was a clear and beautiful stream, full of zoological wonders, and its Venezuelan name was Canyo del Toro, or Bull Creek. On the way up, our bow boatman checked the speed of the canoe, pointed to a straight, round stick of wood floating in the water about a foot below the surface, and said in an awe-struck tone, "*Tremblador!* Grande!"

The stick of wood was smooth, barkless, and of a bluish-gray color; and in reality it was a large specimen of the renowned and dreaded Electric Eel.

Acting on the collector's principle that the first specimen seen must be the first one taken, my companion poised his capybara spear, and drove it into the creature's body. The detachable head promptly came off, and the spearman held fast to the handle.

Instantly the big Eel became a storm centre of the first magnitude; and it writhed and struggled, and thrashed about until it struck against the handle of the spear. Mr. Jackson received such a shock that he cried out from the pain of it, and dropped the spear-handle, which floated on the water.

But not for long. My friend recovered his spear-handle, and drew the fiercely struggling Eel within striking distance of the canoe. Whenever it struck the side of the boat, either with head or tail, we were thrilled by a shock. At last, two or three severe blows on the head, with the club used for killing capybaras, seemed to settle matters, and against the protests of Antonio, the creature was dragged aboard.

To all appearances, the Eel was dead; but a few moments later when Antonio chanced to touch it with his bare foot, at once he broke out in a torrent of anathemas upon all "trembladors." As an experiment, I touched its head with the tip of my finger, and instantly received a shock so severe that my nerves tingled for an hour. A more vigorous application of the capybara club finally killed the creature, and its electric power died with it.

This specimen measured 6 feet 4 inches in length, and I believe that when delivered to advantage its electric power was sufficient to administer a severe shock to the largest elephant. Woe to the crocodile or shark which attempts to dine or sup at the expense of *Gym-no'tus elec'tricus!* While on the Canyo del Toro we saw about ten specimens, always of the same floating-stick appearance, and captured four.

The Lamper "Eel," as the Lamprey is very frequently called, is not a true eel of any sort, and it will be found in its proper place, immediately following the fishes. It is so low in the zoological scale that for it and kindred forms a separate Class has been provided.

CHAPTER LVI

THE ORDER OF PIPE-FISHES AND SEA-HORSES

LOPHOBRANCHI

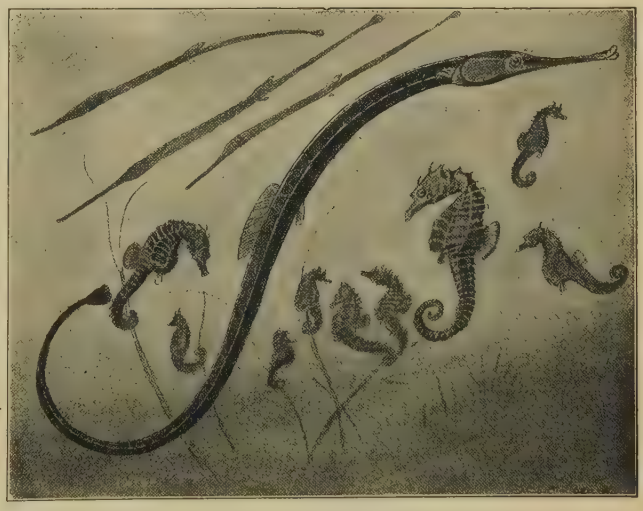
At the foot of the Subclass of Bony Fishes, stand certain small creatures, each of which is so fantastic in form that it requires to be introduced with the solemn assurance, "This is a fish!" At first glance, any one wholly unacquainted with them might from their hard external shells be inclined to regard them as particularly odd crustaceans; but the presence of tiny fins without, and skeletons more or less bony within, place them fairly within the confines of the Bony Fishes.

The Great Pipe-Fish[1] is a long, slender stalk of jointed bone, with queer little fins very far apart, and a head that terminates in a long, hollow tube. But for this very tough and persistent bony armor, other small fishes would devour the Pipe-Fishes, bit by bit, as children bite off sticks of candy. Its armor is so stiff, however, that the wearer moves slowly and with difficulty, and the prey usually sought by this fish is found very small and weak, hiding in the branches of sea-weed, coral clusters, sponges, and the sea-grasses generally. It was for insertion into such hunting-grounds as these that the long, tubular snout of this fish has been developed.

The Pipe-Fishes swim in a half vertical position, as if literally leading up to the introduction of the next species, which swims bolt upright in the water, and fairly caps the climax in fishes. All the Pipe-Fishes are small creatures. Our largest species is found on the Pacific coast, and "reaches a length of 18 inches." (Jordan and Evermann.) There exists in North American waters about thirty species.

The Sea-Horse[2] bears not the faintest resemblance to a typical fish, and is the strangest-looking creature of the whole fish world. It looks like a Chinese dragon, reduced about a thousand diameters. Its minute pectoral fins are so inconspicuous they are at first quite unnoticed, and the fan-shaped dorsal fin seems when in action like a stationary fan with which the outlandish creature frequently tries to fan itself.

At all times the Sea-Horse swims in a perpendicular attitude, and with its prehensile tail it holds itself stationary by grasping any inanimate object that either grows upon the bottom or floats in the water. Like the pipe-fish, it is completely encased in a strong suit of bony plate-armor. The average aquarium Sea-Horse is seldom more than 4 inches in length, but the Gigantic species (*H. ingens*) of the Pacific coast "reaches a length of nearly a foot." (J. & E.) The smallest species, found abundantly about Pensacola, is only 2 inches long.



1. GREAT PIPE-FISH.
2. THE SEA-HORSE.

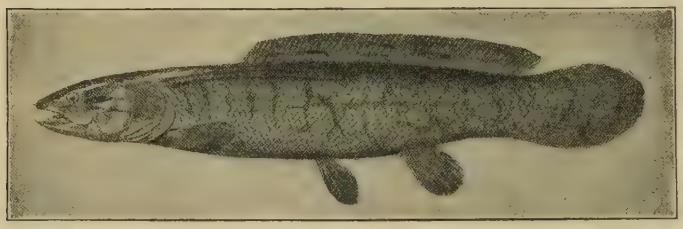
[1] *Syng-na'thus a'cus.*
[2] *Hip-po-cam-pus hep-tag'o-nus.*

CHAPTER LVII

THE ORDER OF THE DOGFISH

HALECOMORPHI

To naturalists, the **Dogfish**[1] is a creature of much interest. Like the prong-horned antelope, it is so unique and peculiar that it has been necessary to create for it a grand division of classification which it occupies all alone. The antelope is only a Family, but this fish is a whole Order. Its other English names are *Mudfish*, *Bowfin*, *Grindle* and *Lawyer;* and since Linnaeus christened it *Amia calva*, in 1766, eleven other naturalists have given it eleven other names in Latin.



THE DOGFISH.

The Dogfish has an air-bladder that is divided into cells, and is a half-developed lung. At intervals it ascends to the surface of the water, gulps down a mouthful of air, just as a turtle does, and descends again. If hindered from rising when the time comes to take in a supply of fresh air, the fish struggles violently, like a mammal about to be drowned; but it can expel air while below the surface. This character indicates that lungs were first developed in fishes, from modifications of their air-bladders. Other characters establish a distinct relationship with the gar fishes, and place it in the Subclass *Ganoidea*. The dorsal fin is low, of uniform height throughout, and is about one-half as long as the entire fish.

By its general anatomy, this fish appears to stand midway between the true lung-fishes and the gar pikes. It is of scientific interest, only, for, save to the negroes of the South, its flesh is quite unpalatable, and valueless as food. It is an inhabitant of sluggish fresh waters, attains a length of 2 feet, and 12 pounds weight. It is found in the great lakes, the Mississippi valley generally, and in a few fresh-water streams on the southern Atlantic coast.

The individuality of the Dogfish is very positive and interesting. Among the small fry of other fishes its voracious appetite renders it very destructive to species of more value than itself. Mr. Charles Hallock, who knows it well, has thus set forth the salient points of its moral character:

"They take frogs, minnows, and sometimes the spoon. Their habitat is deep water, where they drive everything before them. They are very voracious and savage. Their teeth are so sharp and their jaws so strong they have been known to bite a two-pound fish clean in two the very first snap. They are as tenacious of life as an eel. The young, when about six inches long, make a famous bait for pickerel and pike. To use it, run the hook into the mouth right up through the centre of the head, through the brains, cast a hundred times, catch several fish, and at the end of three to six hours he will kick like a mule."

"Put a hundred in a rain-barrel, and you can keep them all summer without change of water. For the aquarium, the young have no equal, and on account of the spot in the tail they are quite attractive; but nothing else than snails can live in the tank. He will kill a lizard or any other living thing the instant it touches the water."

[1] *Am-i'a cal'va.*

CHAPTER LVIII

THE ORDER OF GAR FISHES, OR GANOIDS

GINGLYMODI

To the scientific student, the **Gar Pike** of the middle eastern states, and the big **Alligator Gar** of the Gulf states are two of the most interesting fishes of our whole finny fauna. They are the living representatives of a wonderful lot of dead-and-gone species which many thousand years ago laid the foundations of the fish world. By means of the impregnable bony armor with which Nature wisely provided them, they have been able to withstand the attacks of the enemies that otherwise would have exterminated them.

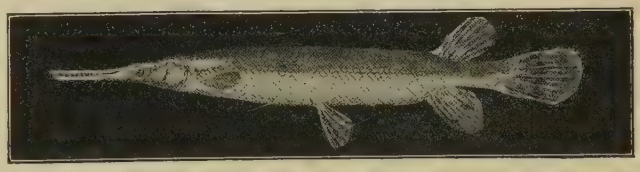
The simplest, and therefore the earliest, forms of fishes are some of the Gan'oids,—as the armored fishes are called,—whose remains now exist only in the rocks of the Devonian age, far down toward the strata which were formed before life was. The first of these fishes—and they were well-nigh the first of all fishes—had their heads completely encased in solid bone, their eyes were placed in the tops of their heads, and they must have lived upon the bottom of the sea. And who shall say how many years have passed since the days when their dead bodies sank in the mud along the shores they frequented? To-day they are found high up in the rocky cliffs of Devonshire, England.

It must be remembered, however, that the armored fishes were not the only ones which existed in those early days. The same rocks have yielded to science the remains of lung-fishes, sharks, and sturgeons; but the so-called "bony fishes" of to-day were undoubtedly of later development than the foregoing.

Our two Gar Fishes are therefore to be regarded as living relics of the Devonian age, or "Age of Fishes." There are others; but for an introduction to them, as well as the fossil forms, the reader is referred to Le Conte's "Geology."

The Long-Nosed Gar Pike[1] is the species which is nearest at hand, and most accessible to teachers and students. It is found in the great lakes, and in large streams generally from New Jersey to Mexico, and northward in the Mississippi valley to Minnesota. It is frequently called the *Bill-Fish* and the *Gar*. It is said to be destructive to the young of other fishes, but Dr. Goode declares that fish remains are "rarely found in its stomach." Its flesh is unfit for food, and, except to educators, the fish is valueless. It is said to attain a maximum length of from 5 to 6 feet, but specimens exceeding 3 feet are very rare, and the majority are certainly under that length.

The armor of this fish is more perfect than any plate armor that man could make for it. It consists of diagonal whorls of solid and highly polished plates of bone, each divided into scale-like sections, and so hinged together that while fully protected the fish has abundant freedom of movement. The dried skin of a Gar Pike is as hard and unyielding as a cylinder of sheet iron.



LONG-NOSED GAR PIKE.

In about the same waters as the preceding species, and very much like it, lives the **Short-Nosed Gar Pike** (*Lepidos'teus platys'tomus*).

The Alligator Gar[2] is a giant in comparison with both the above species, sometimes attaining 6 feet in length. It is essentially a fish of the South, and inhabits the large streams—and also many small ones—of all the Gulf states, Mexico and Cuba. It is readily recognized by its short and broad snout, which is strongly suggestive of the head of an alligator.

As an instance of the manner in which fishes

[1] *Lep-i-dos'te-us os'se-us.*

[2] *Lep-i-dos'te-us spat'u-la.*

sometimes perish through natural causes, and become fossil, Mr. Frederic S. Webster tells the story of a death pool near the Rio Grande. While collecting birds near Brownsville, Texas, he discovered a large pool which had been filled by the overflow of the river, but afterward entirely cut off by the receding of the flood waters. A muddy pool seventy-five feet long by twenty-five feet wide was crowded full of Alligator Gars, living, dying and dead, varying in size from two feet to six. Mr. Webster estimated that that tiny area of water and mud, no larger than a fair-sized ballroom, contained between 700 and 800 fishes, all doomed to speedy annihilation by the evaporation of the remaining water. When he discharged his shot-gun into the mass, pandemonium ensued. The pool became a seething mass of frantic life, and the wild rushing to and fro of the large fishes actually threw smaller ones into the air.

A million years from now, the few men of science who have not yet perished from cold may discover on the summit of a lofty, rock-ribbed mesa at the edge of a great desert, a marvellous deposit of fossil Alligator Gars, and wonder how so many fishes chose to die in the same spot. But only the rocks will then be able to tell the story of Mr. Webster's Pool, and the world will be too cold to care for it.

CHAPTER LIX

THE ORDER OF STURGEONS

GLANIOSTOMI

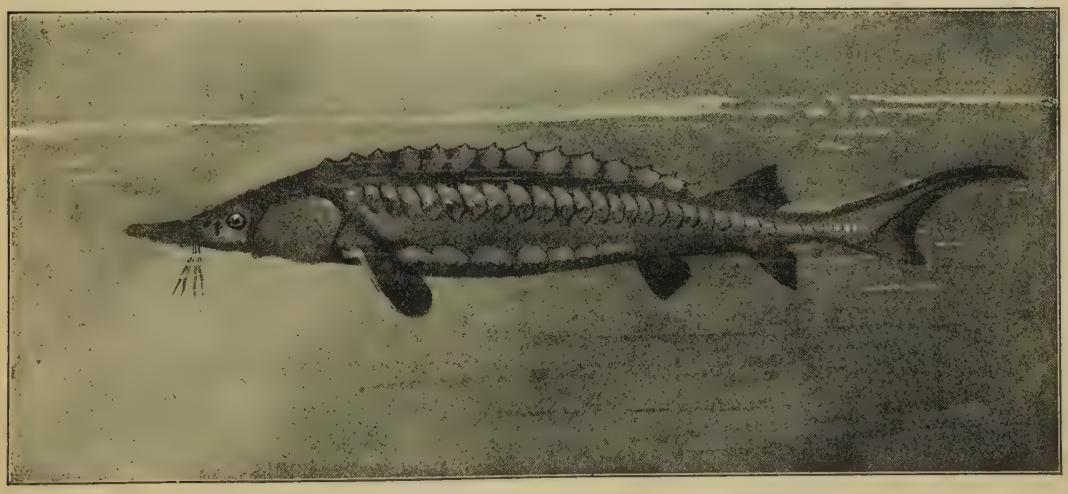
A sturgeon is a big, shark-like, wedge-headed fish, which looks as if Nature had once decided to cover it with a bullet-proof suit of bony armor, but, after setting three or four rows of plates on each side, had grown weary of the task, and abandoned it. Had the plan been wrought out to a finish, it would now be necessary to skin every sturgeon with an axe.

The mouth of a sturgeon is situated underneath the head, and is provided with long, sucker-like lips, for taking food off the bottom. The principal food of sturgeons is small, thin-shelled mollusks, and other fishes are not eaten save on occasions so rare they are not worthy of note.

From the coast of California to the Caspian Sea, wherever they are found, sturgeons are fishes of desirability, and of commercial value in direct proportion to their size. Their smoked flesh is by many considered equal in flavor to halibut, and "caviar" is only the society name of air-tight sturgeon eggs. The twenty living species of sturgeons are distributed at intervals throughout the northern portion of the north temperate zone, across America, Europe and Asia. The American species are but four in number.

The Lake Sturgeon[1] is from 5 to 6 feet in average length, weighs from 30 to 40 pounds, and inhabits the great lakes and adjacent connecting waters of good depth.

The Short-Nosed Sturgeon[2] is a salt-water species, found along our Atlantic and Gulf coasts, from Cape Cod to Texas. This is a small species, only about 2 feet in length, and is of no importance.



LAKE STURGEON.

The Common Sturgeon[3] of our Atlantic coast is the largest and most valuable member of this Order in American waters. It attains a length of 10 feet, and 500 pounds in weight, and to-day at Wilmington, Delaware, its centre of abundance, a large specimen represents about $75 worth of commercial value. The most valuable part is the

[1] *Ac-i-pen'ser ru-bi-cun'dus.*
[2] *A. bre-vi-ros'tris.*
[3] *A. stu'ri-o.*

roe, a cask of which, weighing 130 pounds, is worth $110.

The White Sturgeon[1] inhabits the waters of the Pacific from southern California to Alaska, and the records show it to be a giant among food fishes. Jordan and Evermann quote it up to 13 feet in length, and weighing 1,000 pounds; but the weight of any animal, dead or alive, which ends with two ciphers is certain to be a weight of Estimate, and not of Fairbanks. Strangely enough numerous specimens of this Sturgeon have been taken in Idaho, in the Snake River, weighing from 100 to 650 pounds. "An example 11 feet 2 inches long measured 2 feet across the head." (Jordan and Evermann.)

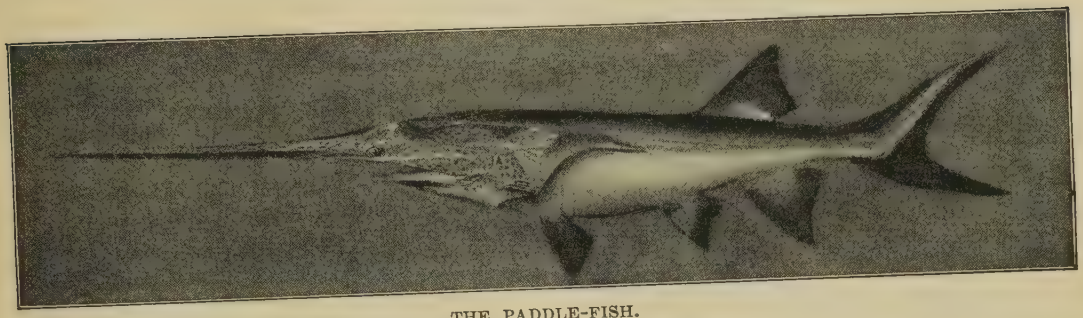
The latest reports on the Sturgeon industry generally are for 12 months between 1921 and 1925. During that period, the total catch of the United States and Alaska amounted to 931,384 pounds, worth $130,785, and in quantity a falling off since 1898 of nearly *five million* pounds!

[1] *Ac-i-pen'ser trans-mon-tan'us.*

CHAPTER LX

THE ORDER OF THE PADDLE-FISH

SELACHOSTOMI



THE PADDLE-FISH.

To some persons, the big **Paddle-Fish,**[1] or **Shovel-Nosed "Sturgeon,"** as it is more commonly called, is one of the wonders of fresh water. Here we find a case of what naturalists call "specialization" which has gone to an astonishing extreme. This is a scaleless fish, with a body very much like a shark, and a half-cartilaginous, shark-like skeleton. It has a low-browed, armor-plated head that runs forward into a broad, thin paddle of bone, one-third the length of the entire fish.

Beyond doubt, this remarkable implement is used in turning up the mud and gravel of the bottoms of the streams in which the owner lives, in searching for food. It is unfortunate that we never can see it in action, and still more so that this fish has not yet been kept successfully in aquaria. Mr. Charles H. Townsend says that in captivity they always injure their paddles against the sides of their tanks, and do not live longer than two or three weeks.

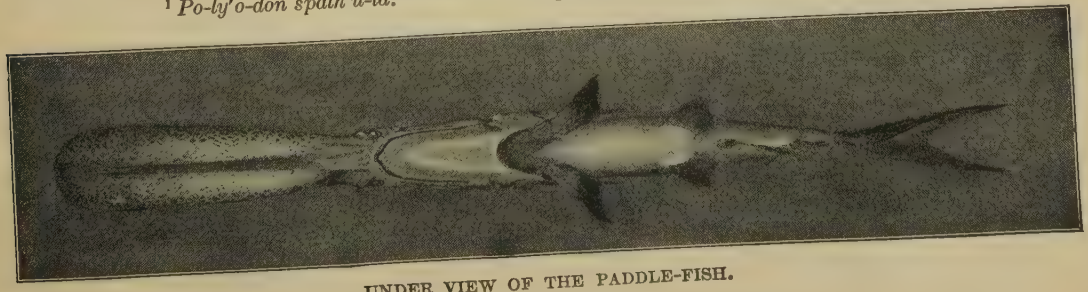
[1] *Po-ly'o-don spath'u-la.*

In "American Food and Game Fishes," Drs. Jordan and Evermann give a number of size records of this fish which will be a surprise to many persons who, like the writer, have seen and handled only medium-sized specimens. The figures given show length in inches, and weight in pounds.

	In.	Lbs.
Lake Manitou, Ind., heaviest on record.[2]		163
Lake Tippecanoe, Ind. (W. C. Harris), length	74	150
Chautauqua Lake, N. Y., length	74	25½
St. Louis (Dr. Engelman), length	70	79
White River, S. Dakota (J. and E.), length	53	18

The latest record is interesting as showing the light weight of what was a long, but very slender specimen. Judging from all available evidence,

[2] This fish and the one next noted was 4 feet in girth.



UNDER VIEW OF THE PADDLE-FISH.

and personal observations, I should place the average length of the Paddle-Fish at 45 inches, and weight 25 to 30 pounds.

The U. S. Bureau of Fisheries' records show that this fish is now coming into use as food, and is finding a ready sale in the markets of the region it inhabits. In some places its flesh is smoked and sold as sturgeon. Its eggs, which are very numerous, and greenish-black in color, make excellent caviar, and are being so utilized at Louisville, Kentucky, and along the Mississippi, in Mississippi and Tennessee.

In 1922, the grand total catch of Paddle-Fish in the Mississippi River and its tributaries amounted to 1,398,991 fish, having a total market value of $132,545. These figures indicate that this species is satisfactorily holding its own.

In a limited sense the Paddle-Fish inhabits the Mississippi valley, from Louisiana to Minnesota, the Ohio, and the Missouri to South Dakota, which is a wide range for a fish so peculiarly formed.

CHAPTER LXI

THE ORDER OF THE CHIMERAS

CHIMAEROIDEI

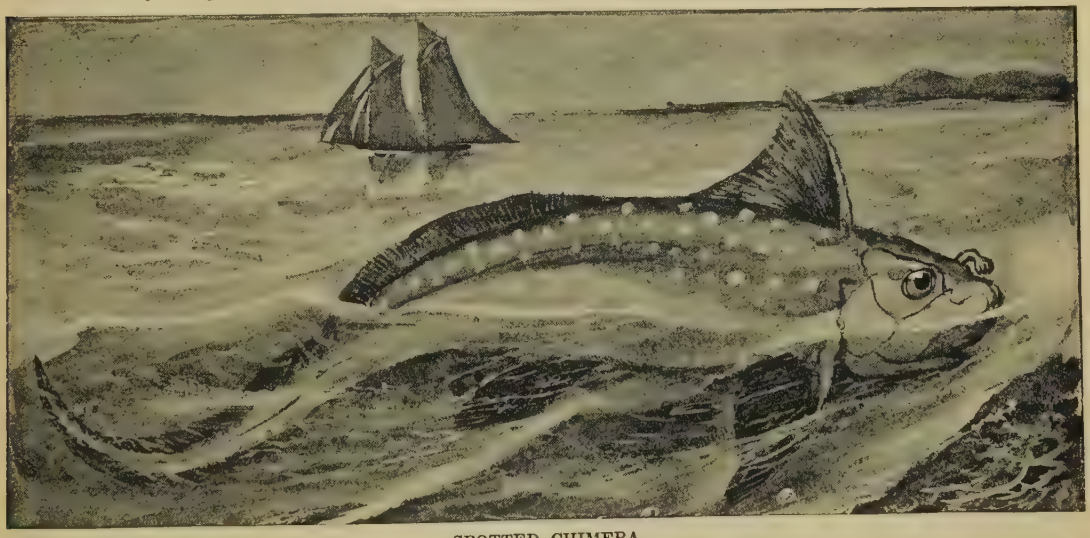
The Chimeras are introduced for the purpose of making our series of fish Orders reasonably complete, and not because of anticipated personal acquaintance with them. For fifteen or twenty years one may live on the Atlantic coast, frequent its fish markets, and fish occasionally at first hand, without once seeing either a live Chimera, or one freshly caught. They inhabit blue water only, have no commercial value save as scientific specimens, and in our Atlantic waters are rarely caught elsewhere than on the off-shore fishing banks of New England.

As a natural result of these conditions, the shark-like chimaeroids are the least known of all the fishes that inhabit our shore waters. Indeed, there are several species of deep-sea fishes that are much more common in fish collections than they appear to be elsewhere. One species, however, of the Pacific coast, has been studied by Dr. Bashford Dean, and it will be set forth on the strength of his description.[1]

[1] "Fishes, Living and Fossil," Columbia University Biological Series, page 100.

The Spotted Chimera,[2] figured herewith, is said to be extremely abundant just off the borders of the submerged plateau that extends all along the northwest coast of the United States. It was frequently taken in the dredge hauls made by the steamship *Albatross*, the majority of the specimens being under 2 feet in length.

Like all the members of this Order,—the total number of which is very small,—this species resembles a big-eyed shark with a cutlass-fish tail.



SPOTTED CHIMERA.

The head is blunt and very thick, and from it the body gradually tapers down to the whip-like tail. The skin is smooth, and the paired fins are shark-like.

The front dorsal fin is provided with anterior spine-folds, like a fan, and may be depressed into a sheath in the body-wall.

The sense organs are similar to those of sharks, and the visceral parts also are shark-like. The skeleton is cartilaginous, and the vertebral axis is notochordal. Of the embryology and life history of the Chimeras generally, practically nothing is known.

[2] *Chi-me'ra col'le-i.*

CHAPTER LXII

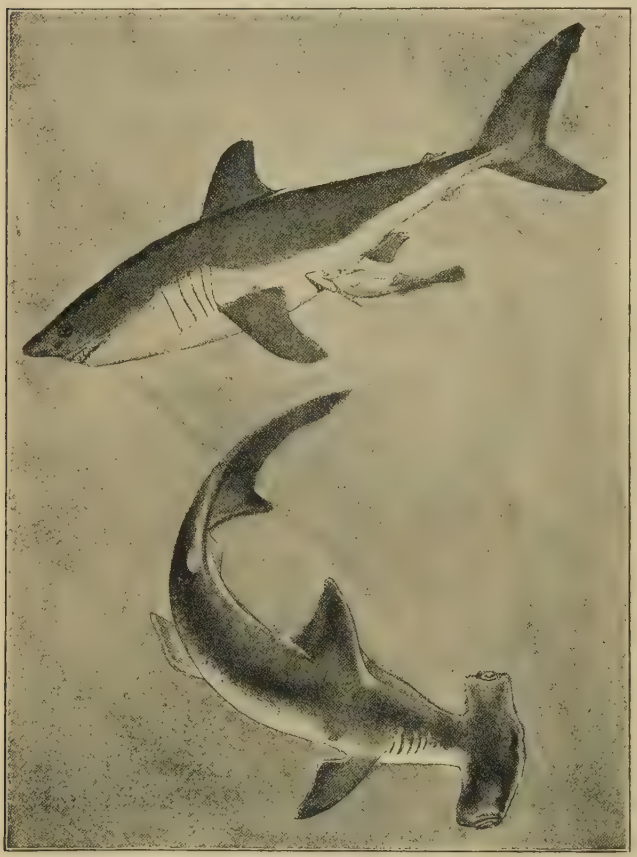
THE ORDER OF SHARKS

SQUALI

We have now reached the subclass of Cartilaginous Fishes.

And what is a "car-ti-lag'i-nous fish?"

Cartilage is a bloodless tissue, commonly called *gristle*, flexible but not elastic, quite colorless, of the consistency of cheese-rind, and of use in the anatomy of animals for sustaining or connecting softer parts. The external ear of man consists chiefly of a convoluted wing of cartilage covered with skin. The so-called "breast-bone" of man is a tree-like development of cartilage designed to bridge together the outer ends of the principal ribs, protect with some firmness the vital organs within, and yet permit the rise and fall of the chest in breathing.



1. MACKEREL SHARK, WITH REMORA ATTACHED.
2. HAMMER-HEAD SHARK.

The Cartilaginous Fishes, embracing the sharks, rays, skates and intermediate forms, are those whose skeletons are largely composed of plates and stems of cartilage, or gristle and but little bone. Instead of bony rays, the fins of these creatures are supported by cartilaginous rays so closely joined together that they form plate-like structures.

General Characters of Sharks.—With few exceptions, sharks have externally the same general form as the typical fishes. Instead of broad, flat scales that overlap each other like shingles, their scales are very minute, horny, sharp-pointed and closely packed together. When the skin of a shark is stroked from head to tail, it feels like a hair-cloth sofa, but when stroked the other way, it is like the sharpest sand-paper. For centuries shark-skin has been used for smoothing and polishing wood and other substances; and when prepared for that use it is called "shagreen."

Instead of one very large gill-opening, as in typical fishes, a shark has usually five small slits in the skin behind the gills, which are capable of being tightly closed. In nearly all species the mouth is situated underneath the head, and often it is of enormous proportions. The jaws are composed of cartilage, the teeth are usually triangular, and set along the edge of the jaw, in rows crosswise with the edge of the mouth. Behind each active

and visible tooth there is a line of reserves, from three to five in number, always growing outward and crowding to the front, so that as soon as a tooth in the line of battle becomes much worn, or in any way weakened or broken, it is crowded off the jaw, and a new tooth is thrust forward into its place.

Many sharks bring forth their young alive; but others (the majority, perhaps) lay eggs. Some of the egg cases are of remarkable form. Some of them are rectangular, flattened, and provided at each corner with a long, threadlike tendril with which to attach to any fixed object.

Sharks very rarely exhibit color patterns, or bright colors of any kind. As befits pirates and freebooters, they are mostly ashy gray, or drab, —the most inconspicuous colors at sea, both for sharks and men-of-war. The small Tiger Shark, of Ceylon (*Stegastoma tigrinum*), is one of the few sharks of variegated colors, and its handsome pattern of yellow and black is a welcome variation.

Only a few of the whole 150 species of sharks can rightly be classed as "man-eaters." A typical "man-eating shark" is one which is very large, exceedingly voracious, practically devoid of fear of mankind, and so aggressive that it will attack a swimmer at the surface of the water, and devour him regardless of his resistance. The standard prey for sharks consists of small fishes, squid, jelly-fishes, crabs, lobsters, and other non-combatants.

Occasionally, however, the big Tiger Shark[1] of the Atlantic chooses a victim in his own class as a fighter. Dr. Goode notes the capture, by Captain Atwood at Provincetown, Mass., of a specimen which contained "nearly a whole full-grown sword-fish"; and "ten or twelve wounds in the skin of the shark gave evidence of the contest that must have occurred."

The "man-eater shark" is not a myth, for that name is applied to the great white shark, a species which ranges from our Atlantic coast to Australia, and on to California. In the tropics it attains a length of 30 feet. With us this creature is rated as "exceedingly rare," and judging from Dr. Goode's notes, not more than a dozen specimens are caught and identified in a century. The only loss of life from it on our coast, so far as recorded, occurred in 1830.

[1] *Gal-e-oc'er-do ti-gri'nus.*

It is indeed fortunate, and merciful to mankind, that sharks generally are harmless to man. Were they otherwise, the terrors of the sea would be greatly increased.

The great pressure now upon our true food fishes has caused the elevation of the shark and sword-fish to places in that class. In 1924 Florida is credited with an intake of 3,000,000 pounds of shark, worth $24,000. The total annual consumption of shark meat in the United States, according to the latest records in 1927, is 3,157,033 pounds, valued at $28,471.

The Mackerel Shark[2] is a fair type of the sharks of the world. It is common along both coasts of the United States, and the length of fully grown specimens is between 9 and 10 feet.

The Hammer-Head Shark[3] is a genuine curiosity. With no intermediate forms leading up to this strange departure, the head of this creature suddenly thrusts out on each side a great shelf of cartilage and skin, in the outermost edge of which the eye is situated! It is like a flat-headed shark with a seven-inch board twenty inches long placed squarely across its forehead. This species is found in the seas of the tropics and subtropics, practically around the world. Once when the writer was approaching the coast of Barbadoes, on a sailing vessel, a large Hammer-Head swam for fifteen minutes close to the bow of the ship, and quite near the surface. In the Havana market I once obtained a specimen nearly ten feet long. This species brings forth its young alive, and occasionally specimens are taken as far north as New Jersey.

Sizes of Sharks.—The majority of the species of sharks are under 8 feet in length, and a few are as small as 2 feet, when adult. The largest species are the following:

The **Basking Shark** (*Rhinodon typicus*)	45 ft.
The **Bone Shark** (*Cetorhinus maximus*)	36 "
The **Man-Eater** or **White Shark** (*Carcharodon carcharias*)	30 "
The **Great Tiger Shark** (*Galeocerdo tigrinus*)	30 "
The **Hammer-Head** (*Sphyrna zygaena*)	15 "
The **Blue Shark** (*Carcharias caeruleus*)	15 "
The **Thresher Shark** (*Alopias vulpes*)	15 "
The **Mackerel Shark** (*Lamna cornubica*)	10 "

[2] *Lam'na cor-nu'bi-ca.*

[3] *Sphyr'na zy-gae'na.*

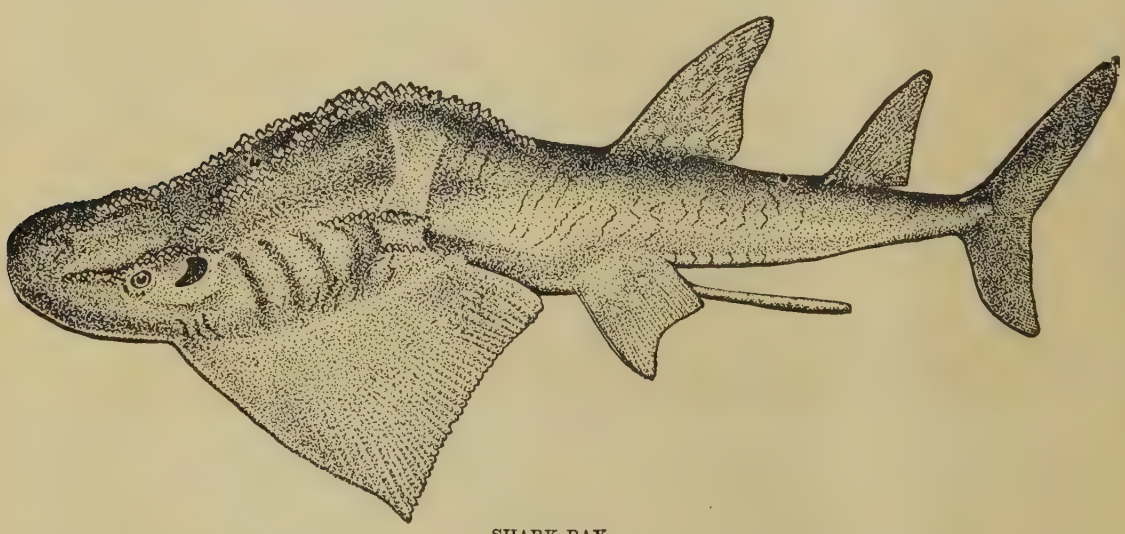
CHAPTER LXIII

THE ORDER OF RAYS AND SKATES

RAIAE

The rays and skates are merely flat-bottomed, side-wheel sharks, built to navigate very shallow waters. From the typical shark down to the broadest and flattest ray, the change of form is shown by a beautifully complete series of living links, several of which it has been my privilege to handle and dissect fresh from their home waters.

Of these connecting links, the most interesting is the rare and wonderful **Shark-Ray,**[1] of the Indian Ocean, a fine specimen of which was caught for me in the shallow waters between Ceylon and India. It is as nearly as possible half shark and half Ray, and is shown in the accompanying illustration.



SHARK-RAY.

Between this and the typical ray stands the **Beaked Ray,**[2] much flatter than the preceding, and with the pectoral fins taking on ray-like spread and thinness. But the long, fleshy body and triangular head still proclaim very unmistakably the line of relationship with the sharks. Several species representing this intermediate type are found in our waters, but they are not common, and the real home of the genus is in the tropics and subtropics.

The Sawfish,[3] of the Florida coast, and many portions of the tropics farther south, is celebrated among fishes because of the very long, flat beak of bone which projects forward from its snout, armed on both sides with formidable teeth. The length of this saw is more than one-third the length of the head, body and tail. It is, we may safely assert, strictly a weapon of defence, not offence; for unless it is used as a shovel in searching for mollusks and other food on the bottom of the sea, it is useless in the search for food.

When the Sawfish is threatened with attack, however, it defends itself by quickly curving side-

[1] *Rham-pho-ba'tis an-cy-los'to-mus.*

[2] Of the genus *Rhi-no-ba'tis.* The species sometimes seen on the coast of Florida is *R. len-tig-i-no'sus.*

[3] *Pris'tis pec-ti-na'tus.*

wise, thereby giving a sweeping sidewise stroke with its saw, and swiftly repeating it in the opposite direction. On a Sawfish fourteen feet in length, the saw is about four and a half feet long, and the teeth project about one and a half inches from the bone.

This creature is an intermediate form between the sharks and the typical rays, and in reality it is a shark-ray. Its eyes are a-top of its head, its mouth is underneath, its body in front of the dorsal fin is quite well flattened, and its pectoral fins have "ray" written all over them. The maximum length attained by it is said to be 15 feet. Because of the long, flat beak of this creature, it has become associated in many minds with the swordfish, but structurally the two are as far apart as a deer and a bear.

THE SAWFISH.

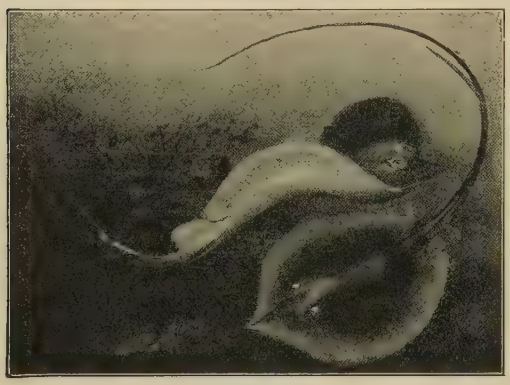
Notwithstanding the fact that there exists a group called the Order of Flat-Fishes (halibuts, flounders and soles), the rays are by far the flattest of all fishes. For example, the Spotted Ray of Ceylon is about 5 feet across, 5 inches thick at the centre of the body, and at the edges its great wings flatten out into thin air. From the body, which really is quite small, and centrally located, a thin sheet of cartilage, consisting of a great number of very long, jointed rays firmly joined together, extends outward to the very tips of the wing-like fins. Upon this is laid a thin layer of flesh, and over all is spread the rough and tough skin. The tail is like a long, stiff whip, with a many-barbed bone stiletto midway,—a very dangerous weapon to be so carelessly exposed.

To a taxidermist, the mounting of a large ray is about the most calamitous task he can possibly encounter. The trouble lies in the perpetual shrinking after mounting.

The Sting Ray,[1] or, by corruption, **"Stingaree,"** is one of the greatest pests of the eastern coast of the American continent. From Cape Cod to the Orinoco, and I know not how much farther beyond, this vindictive and cruel fish lies, assassin-like, half buried in the sand along shore, ready and anxious to drive its spine into any naked foot that comes within striking distance. The upper surface of the animal closely resembles the loose sand in which it hides, and the spine makes a ragged and ugly wound. The spine is long, dagger-like, and barbed like an arrow all along both edges, so that the withdrawal of it from a wound is very painful. On the lower Orinoco I saw a strong man who was then in the seventh week of disability from the stroke of a

[1] *Try'gon sa-bi'na.*

Sting Ray in his foot; and in the Malay Peninsula I treated a Malay fisherman whose hand had been completely transfixed by the spine of a huge ray.



STING RAY.

Fortunately, this abominable creature is averse to cold, or even moderately cool waters, and is rarely encountered even as far north as Florida. On our coast, one may bathe for a lifetime without seeing even one; and in all waters they carefully avoid crowds of bathers.

The gigantic creature known as the **Devil-Fish**[1] is the largest of all rays, and to many persons, even the most truthful accounts of some of its doings will seem beyond belief. To begin with, its maximum size of *twenty feet* across its "wings" is almost incredible. The towing of a good-sized fishing smack by a harpooned Devil-Fish, going for miles at race-horse speed, is another wonder of the deep.

Many years ago, the planters on the coast of South Carolina found royal sport in harpooning this monster, and conquering it. In a volume entitled "Carolina Sports," the Hon. William Elliott has drawn this picture: "Imagine a monster many feet across the back, having powerful flaps or wings with which he drives himself furiously through the water, or vaults high in the air, his horns projecting several feet beyond his mouth!"

If a Devil-Fish could leap out of water,—which there is good reason to suppose that it could do,—it would look as Mr. Beard has represented it in his illustration.

So far as can be learned, large examples of this creature are now rarely observed, and still more rarely captured. Its centre of abundance now appears to be off the Gulf coast of Florida; but it is also found on the coast of southern California.

[1] *Man'ta bi-ros'tris.*

THE DEVIL-FISH.

CHAPTER LXIV

THE LOWEST CLASSES OF VERTEBRATES

There are a few creatures which, by reason of their internal skeletons and jointed back-bones, are justly entitled to stand with the vertebrates, but yet are lower in the scale than the lowest fishes. For these it has been necessary to create two grand divisions of the first rank; and they stand as two small and very low Classes. It is because of their very low position in the zoological scale of vertebrates that it becomes important to know them.

THE LAMPREYS.

Class Marsipobranchii.

A Lamprey is an aquatic creature which bears so strong a resemblance to an eel that for a long period all lampreys were regarded as true eels. Even to-day, the most important of our species is, by unscientific persons, almost universally called the **"Lamper Eel."** In view of the general external resemblance of these creatures to eels of similar size, it is not strange that their true character remained for a long period quite unknown. As a matter of fact, these creatures forcibly illustrate the unwisdom in animal classification of attaching too much importance to external characters.

The lampreys are the lowest and last creatures that have the spinal cord expanded at its upper end into a brain, and encased in a skull. But the skull is imperfectly developed, and without jaws; there is no shoulder girdle, no pelvis, no limbs, no ribs, and no paired fins. There is a single median nostril, the gills are purse-shaped, the skin is naked like that of an eel, and the skeleton is cartilaginous. The gills are in the form of a fixed sac, the gill openings consist of a row of tiny round holes along the side of the body, and the mouth is specially formed for suction.

It is evident from the foregoing characters that the lampreys are creatures of very simple form, lacking almost all the evidences of special development which characterize the higher fishes. Externally, their very modest median fins are the only visible signs that they are not marine worms.

The Sea Lamprey[1] is the best and most available example of the Class *Mar-si-po-branch'ii.* "The mouth is completely circular, and forms a great and powerful sucker, surrounded by fleshy lips that are supported on a framework of cartilage and studded with tentacles. This mouth is covered over its entire interior surface with strong teeth arranged in concentric circles. A large double tooth, situated above the aperture of the mouth, indicates the situation of the upper jaw, and seven or eight great teeth represent the lower jaw. Even the tongue carries three large teeth, deeply serrated on their edge."[2]

With a mouth specially formed and savagely equipped for suction, it is no surprise to find that this creature is a blood-sucking parasite, preying upon other forms of marine life. It is often found attached to shad, sturgeon, sharks, cod, halibut and mackerel. It fastens to its victim beneath the pectoral fins, tears at its flesh with its rasping circles of teeth, and sucks its blood "until the flesh becomes as white as paper." Beyond doubt, these creatures destroy a very considerable number of valuable food fishes. Fishermen charge to the account of the Lamprey the raw spots and sores frequently found upon the bodies of sturgeons.

Formerly the Lamprey was greatly esteemed by the people of Massachusetts as a food "fish." In the Merrimac River it was captured in great numbers, and salted down for winter use. While this industry, and its object, have both greatly decreased, in some portions of Connecticut the Lamprey is yet taken, as often as it can be found, and thankfully consumed. The species specially mentioned varies in length from two to three feet, but the *Brook Lamprey,* and all the

[1] *Pet-ro-my'zon ma-ri'nus.*

[2] "Fishery Industries of the United States," Part I, p. 677.

fresh-water species are much smaller. Fortunately, none of the fresh-water species are so injurious to fishes as the Sea Lamprey.

According to Jordan and Evermann's "Fishes of North and Middle America," there are in American waters ten species of lampreys, and two of their very near, but still lower, relatives, the *Hag-Fishes*. They are scattered at intervals from Alaska to New England, in brooks, rivers, lakes, estuaries and various other bodies of shallow water. They are most accessible in fresh water, on a stony or gravelly bottom; and whenever in such a situation you find an eel-like creature holding fast to a stone by the suction of a big flat mouth on the end of its head, know of a surety that it is a Lamprey.

THE LANCELETS.

Class Leptocardii.

The long and interesting chain of Vertebrates ends in a very weak and insignificant link. The great work entitled "Fishery Industries of the United States" dismisses this creature with only two and a half lines, and leaves three-fourths of the page blank.

And truly, the **Lancelet,** or **Amphioxus,**[1] is not a creature calculated to arouse enthusiasm. Its skeleton is composed of membranes and cartilages. It has no brain, nor even a skull in which to develop one. It is neither eel-like nor worm-like, but as its name implies, it is shaped like the head of a lance. The middle line of the body is provided with weak and indifferent fins. There is no proboscis, and the mouth is slit-like, and fringed with hair-like filaments. All the above characters, and many others of a purely technical nature, are set forth in "The Fishes of North and Middle America," where eight species are recognized.

These small, naked, colorless and translucent creatures are found "embedded in the sand in the shallow waters of warm coasts throughout the world." They are of special interest only because they are the lowest of the Vertebrates, and on the whole they constitute a very ignominious ending for the highest grand division of Nature.

[1] The West Indian Lancelet (*Brach-i-os'to-ma car-i-bae'um*), is found from Beaufort, N. C., to the mouth of the La Plata.

And thus ends our bird's-eye view of the Vertebrates, setting forth the prominent types and examples which every intelligent American should know. *It is here, and here only, that "specialization" may properly begin!* Behind lie the Mammals, Birds, Reptiles and Fishes; beyond lie the mighty hosts of the Invertebrates,—Crustaceans, Insects, Mollusks and others. In any one of these grand divisions of life, the special student may wander for a lifetime in a wonderland of his own, and to the last find each day filled with new light and new joys in the unending revelations of Nature.

THE END.

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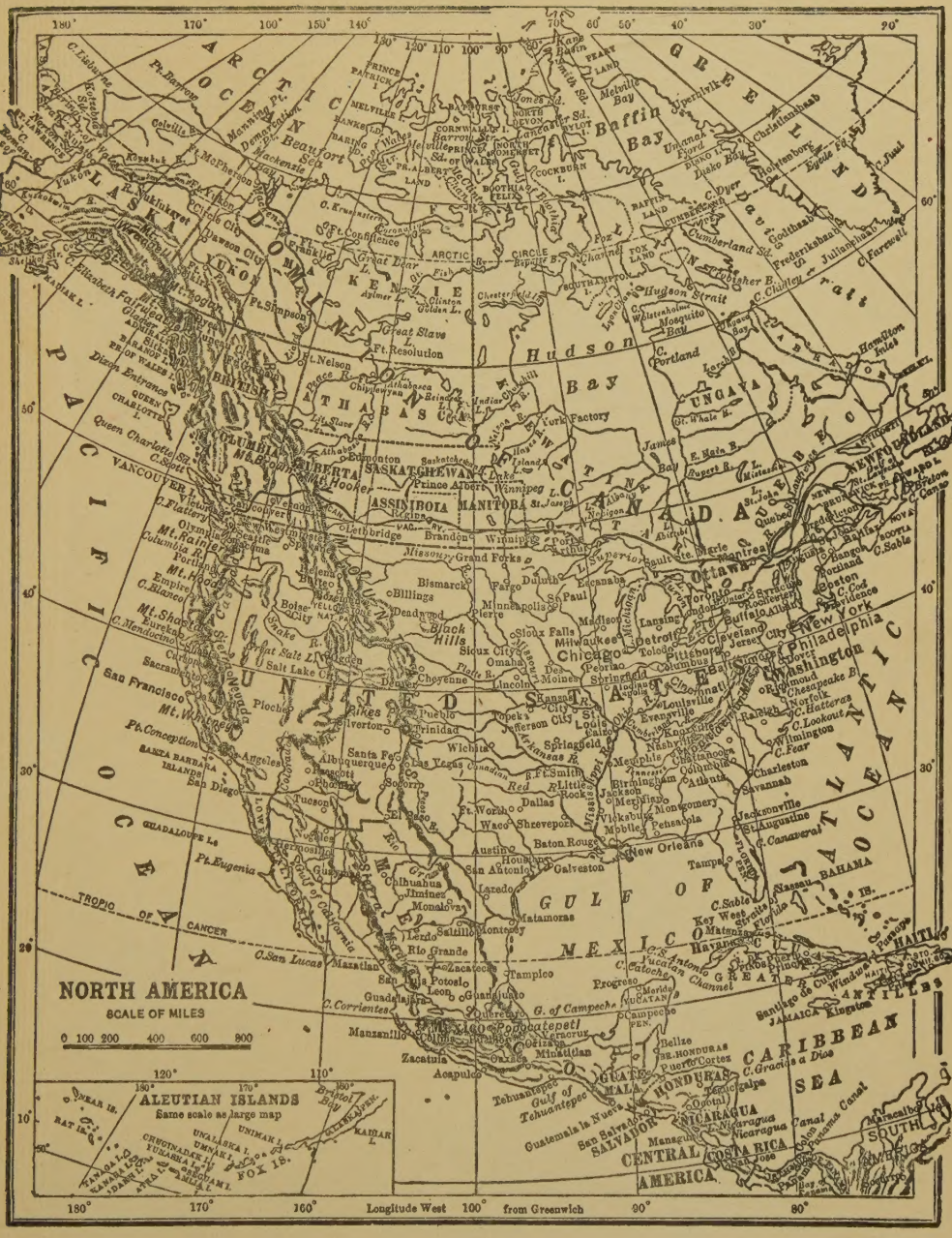
NORTH AMERICA
SCALE OF MILES
0 100 200 400 600 800
ALEUTIAN ISLANDS
Same scale as large map
Longitude West 100° from Greenwich
ARCTIC OCEAN
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
CARIBBEAN SEA
GREENLAND
Baffin Bay
Hudson Bay
UNITED STATES
CANADA
MEXICO
CENTRAL AMERICA
WEST INDIES
TROPIC OF CANCER
Mt. McKinley
Mt. Logan
Mt. Elias
Mt. Rainier
Mt. Hood
Mt. Shasta
Mt. Whitney
Popocatepetl
Pt. Barrow
Pt. Conception
Pt. Eugenia
C. San Lucas
C. Mendocino
C. Flattery
C. Prince of Wales
C. Race
C. Farewell
C. Chidley
C. Hatteras
C. Lookout
C. Fear
C. Canaveral
C. Sable
C. Gracias a Dios
Yukon R.
Mackenzie R.
Columbia R.
Colorado R.
Rio Grande
Mississippi R.
Missouri R.
Ohio R.
St. Lawrence R.
Hudson Strait
Great Bear L.
Great Slave L.
Great Salt L.
Lake Winnipeg
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
Lake Nicaragua
Panama Canal
Nicaragua Canal
Tehuantepec
Gulf of Tehuantepec
Yucatan Channel
Behring Sea
Behring Str.
Bristol Bay
Kamtschatka
Unimak I.
Unalaska I.
Umnak I.
Behring I.
Copper I.
Attu I.
Semichi I.
Buldir I.
Kiska I.
Tanaga I.
Amchitka I.
Atka I.
Adak I.
Rat Is.
Near Is.
Andreanof Is.
Fox Is.
Andreanof I.
Four Mts. I.
Seguam I.
Tanaga I.
Kanaga I.
Semisopochnoi I.
Nunivak I.
St. Matthew I.
St. Lawrence I.
St. Michael
Nulato
Anvik
Nushagak
Kuskokwim R.
Yukon R.
Kotzebue Sd.
Norton Sd.
Kuskokwim Bay
Cook Inlet
Kodiak I.
Kodiak
Sitka
Juneau
Wrangell
Dawson City
Fort Simpson
Fort Resolution
Fort Yukon
Fort Chipewyan
Fort Liard
Fort Nelson
Fort Selkirk
Fort Macpherson
Fort Good Hope
Fort Norman
Fort Rae
Fort Anderson
Fort Yukon
Fort Hope
Fort Churchill
Fort Severn
Fort Albany
Fort Moose
Fort Rupert
Fort Simpson
Fort Vancouver
Fort Hall
Fort Laramie
Fort Union
Fort Benton
Fort Garry
Fort Pierre
Fort Snelling
Fort Dearborn
Fort Wayne
Fort Pitt
Fort Niagara
Fort Ticonderoga
Fort Duquesne
Fort Frontenac
Fort Oswego
Fort Stanwix
Fort Edward
Fort Miami
Fort Detroit
Fort Mackinac
Fort Erie
Fort Gaspe
Fort Chambly
Fort Cumberland
Fort Howe
Fort Sackville
Fort Massac
Fort Chartres
Fort Kaskaskia
Fort Vincennes
Fort Jefferson
Fort Loudon
Fort Prince George
Fort Henry
Fort Chiswell
Fort Watauga
Fort Nashborough
Fort Donelson
Fort Henry
Fort Pillow
Fort Gibson
Fort Smith
Fort Towson
Fort Jesup
Fort Wilkinson
Fort Mitchell
Fort Hawkins
Fort Mims
Fort Mobile
Fort Barrancas
Fort Pickens
Fort Gaines
Fort Morgan
Fort Jackson
Fort Moultrie
Fort Sumter
Fort Johnson
Fort Pulaski
Fort Marion
Fort Caroline
Fort Matanzas
Fort Dauphin
Fort Royal
Fort Dauphin
Fort Louis